HOW TO GROW 100 BUSHELS OF CORN PER ACRE ON WORN SOIL

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YOURS FOR ONE HUNDRED BUSHELS OF CORN PER ACRE ON WORN SOILS.

William C. Smith.

How to Grow One Hundred Bushels of Corn Per Acre On Worn Soils

WILLIAM C. SMITH
OF INDIANA

"CORN IS KING"

SECOND EDITION

REVISED, ENLARGED AND ILLUSTRATED

CINCINNATI
STEWART & KIDD COMPANY
1912

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THE farmer of the past scorned the study of scientific agriculture. He found the soil rich in the elements that produce storehouses of riches. He touched it with the wand of greed and neglect—it was strangled with its wasted fertility.

THE modern farmer became a student of scientific agriculture. He found the soil depleted and despoiled of its fertility. He touched it with the wand of his knowledge—it became rich in the elements that produce a hundredfold.

THERE grows in Nature's Garden the plants with which the farmer can restore his sick, worn-out soils. These plants are the silent working forces of Nature that do their work better than any artificial agency devised by man; thus it behooves us to study Nature's way of doing things.

"Accuse not Nature, she hath done her part. Do thou but thine."—Milton.

"THE CLEARIN'."

PROEM

TO FIRST EDITION

IN a little frame farmhouse on a pioneer's farm, in the Indian Reserve, out of which Howard County, Indiana, was carved, the author first saw the light of day. His first vision of the world was through the six by six glass windows out across the door yard and public highway into the "clearin'." His father, a sturdy pioneer, had settled in this wilderness abounding in gigantic walnut, poplar and oak trees, interspersed with the smaller varieties of timber and underbrush, and by strength of muscle alone, was subduing the forests and making the land to blossom with the fruits of the husbandman.

The pioneer father is sleeping now. He sleeps beside the faithful wife who gave him companionship in the days of his toil. He sleeps in the beautiful land made so by the strength, toil and endurance of the pioneer.

To the memory of that pioneer father, who loved the soil, this book is dedicated; and as the pioneer fathers subdued the land from the wilderness and gave it to their children, rich in the fertility that Nature gave it, may the children so farm and treat it that that fertility may increase and not decrease as the years go by.

The author loves the soil or else this book would have ne'er been born.

Loving the soil as he does, his indignation is aroused when he sees it despoiled by the soil robber. If this book will only awaken the conscience of the soil despoiler, the author will feel that his efforts have not been in vain.

WILLIAM C. SMITH.

Delphi, Indiana,
January, 1910.

PROEM

TO SECOND EDITION

THE first edition of this book is exhausted. It having met with such an unexpected, flattering reception, a second edition is ventured.

In the two years that the first edition has been before the public, the author has received so many commendations from the press and people regarding the merits and helps of his book, that he feels that he must have touched a key note of worn soil restoration, the greatest and most important problem for solution now before the people.

He, therefore, perceives that it is a greater honor to have so important a part in this great soil restoration movement, than to be honored with any high office in the gift of the people.

No nation can become a power without a fertile soil. When a nation's soil becomes worn and loses its power to produce paying crops, then death and decay is written on its very vitals.

If we would have our nation to continue its place at the head of nations, we must maintain the fertility of our soils and prevent, by every possible means, their exhaustion.

It is the hope of the author that this book and its lessons may play an important part in so solving the soil

problem, that our soils will be kept to the highest state of fertility, that this nation may continue great.

WILLIAM C. SMITH.

Delphi, Indiana,
January, 1912.

INTRODUCTION

TO FIRST EDITION

ABANDONED farms and decreasing production of our farm lands is the present-day menace of our country. Increasing population, decreasing fertility of our soils and fewer acres of new land opened for settlement, brings us each day nearer the solution of the problem, how shall we feed our people?

The answer to the question is the "Renovation of Worn-out Soils" so that they will again produce as they did when our forefathers subdued them from the wilderness that held them in subjection for centuries.

Renovation of the Soil — what does it mean?

It means to make the soil over again, to restore it to freshness and vigor — to renew it.

Too many American farmers have gone upon the principle that their land will never wear out. Their fathers entered upon land covered with the virgin forest, rich in all the elements that make good soil; the forests were subdued and the land brought into cultivation; bountiful crops were produced because the soil was well supplied with humus, nitrogen, potash and other elements found in first class soils. Year after year bumper crops were gathered from these lands, the pioneer died, and his sons and sons' sons continued to farm these lands in

the same manner and with the same methods as they were farmed by the pioneer.

It did not seem possible to the sons and sons' sons that these rich lands could ever reach the point of exhaustion, or that the time would come when they must be farmed and treated in a different manner than when they were first cleared and planted, yet that very time has come to millions of acres of American soils.

Millions of acres of our land that once produced from seventy-five to one hundred bushels of corn per acre will not now produce twenty bushels to the acre. These acres have gone into "agricultural bankruptcy."

Being confronted with this condition, what can we do to remedy it? Is there a remedy and is the remedy a sure and quick one? The remedy must be quick, for we cannot wait fifty years as England did to restore our soils.

The purpose of this book is to give the remedy and to prove that it is a sure and quick one.

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CHAPTER I

SOILS

SOIL is defined as being the upper stratum of the earth or that compound substance which furnishes nutriment to plants, or which is particularly adapted to support and nourish them.

Soil varies in depth from a few inches to several feet. Clay soils were produced, in part, by the wearing down and decomposition of rocks containing aluminous minerals, as granite. Sandy soil consists of fine particles of stone placed where found, by the washing of water. Muck soil is produced by the decay of large quantities of vegetation.

Clay and sandy soils were originally improved and made rich by the addition for centuries of vegetable matter such as leaves, weeds and other vegetation.

We agree with him who said "that the condition of the soil is of more importance than its character." Any kind of soil, whether clay, sandy or muck, can be made to produce large crops if put in proper condition.

While it is true that clay or heavy soils have more of the elements of plant growth in them, yet sandy or muck soils by proper treatment will produce as much, if not more, than the clay or heavy soils.

In life's battles the "knowing how" is the entering wedge that opens the way to success. So it is in the

treatment of the soils, the "knowing how" to put them in condition is the secret of success in growing crops.

The "whip and spur" method of farming, so long practiced in the United States, by which our soils have been subjected to the process of getting all you can out of them, without the return of anything to maintain or increase fertility, has so exhausted vast areas of our soils that they no longer produce paying crops.

Any soil that will not produce paying crops may be justly termed a worn-out soil. These worn-out soils abound in all parts of our land. Even the rich corn belt is not immune from the curse of worn-out soils.

As a rule a greedy husbandry or a sordid tillage has been the producer of worn-out soils, although the deceptive theory of crop rotation has been to a degree a producer of them; for crop rotation alone will not maintain soil fertility. It is but a stimulant.

Worn-out soils being so extensive, then, has not their restoration become the vital problem of the hour?

It is appalling in going over the country to see so many farmers so treating their lands as to bring them each day nearer the doom that hangs over all mistreated lands, "the abandoned farm."

Not one farmer in ten is giving his land a chance. Not one in ten seems to know how to build up his soil, or if he does, he seems to be going on the principle that he can get enough from his land to support him during his lifetime and does not care for his posterity or future generations.

He is like an ex-governor of a great state who spent his declining days on the farm which before he died was

in the worst condition of any in the neighborhood. People wondered why a man whose life and business in other lines had been so successful should allow his farm, upon which he was residing, to get into such a condition. The governor was interrogated regarding the matter and replied, " I am not farming for future generations."

But it is encouraging to see so many of our great financiers, statesmen and people in the humbler walks of life becoming interested in soil restoration. Our agricultural schools are doing a noble work along this line.

If it be true that the condition of the soil is of more importance than its character, then it is not necessary for us to go into the discussion of the relative value of the different kinds of soils, further than to say that some of the extreme sandy soils of New Jersey and Long Island have by proper treatment been transformed into the richest of soils; so have the sandy lands of Holland been made worth $3,000 per acre by proper treatment.

After thorough study, backed up by actual experiment, we make the statement that most any sandy or clay soil can be made to yield 100 bushels of corn per acre.

That this can be done, and done quickly, we have demonstrated by actual experiments.

Three elements are necessary to make good soils: Potash, phosphorus and nitrogen; and the last mentioned, according to the best authority, is the " most precious, the most important and the most costly." It is the element soonest farmed out of fertile soils.

It is said that " nitrogen promotes growth, phosphorus produces fruitfulness and early maturity, and potash increases quality."

Most sandy, clay or heavy soils contain sufficient potash and phosphorus, but are wholly lacking in humus, organic matter and nitrogen.

One writer says that "corn, oats and wheat are made of plant food; that they consist of ten certain elementary substances; that a ton of corn contains a ton of these plant food elements, of which only three are secured by the corn plant from air and water. The seven are taken from the soil. The three elements make up more than ninety per cent. of the corn, but the other seven are no less essential to plant growth."

The seven elements mentioned and which make up but ten per cent. of the corn crop, are generally found in sufficient quantities in all soils to last from 500 to 17,600 years.

The chief lack of worn-out soils is humus, organic matter and nitrogen.

Humus is the residue of decayed organic matter.

Organic matter is vegetable or animal matter, like leaves, roots, sticks, grasses, manure, straw, etc.

Therefore that which is left of organic matter after it has passed through its process of decay is humus. It appears in the soil as a dark-colored substance, and where it exists in abundance renders the soil black.

Soils originally procured their entire supply of humus and a large portion of nitrogen from decayed vegetation or organic matter, secured in their progress of formation.

Virgin soils procured their largest supply of nitrogen from the air through the work of those soil bacteria who make their homes in the root nodules of those plants known as the nitrogen-gathering plants or the legumes,

and who draw for their food the nitrogen from the air, and drawing more than they need, store the surplus in the soil where it becomes available for plant food.

There are thousands of nitrogen-gathering plants, some of them being the trees of the forests.

Go into the virgin forest such as once covered the middle west — and there are some such forests existing to-day, but they are not large — and you will see between the trees, the ground covered with decayed and decaying tree trunks and limbs and a heavy coating of leaves. A large number of the trees, and much of the undergrowth of these forests, are of the legume family, or the nitrogen gatherers of the soil.

This decaying of trees and leaves, and nitrogen gathering, has been going on for hundreds of years, thus storing up a vast storehouse of precious elements of rich soil. Is it any wonder then that lands when first cleared of the virgin forest were so rich?

Continued cultivation of cleared lands without the addition of anything to reproduce these original elements has exhausted them from our soil, and until we can get them back into the soil again, our lands, lacking in these elements, will become more worthless as the years go by.

When we consider that it took centuries to put large quantities of nitrogen, organic matter and humus into our soils, it seems an impossible task to get back into these soils again within a short time the quantities of nitrogen, organic matter and humus that took so long to put there in the first instance.

Barnyard manure will put these elements back into the soil quicker than any other known agency, but this rem-

edy is impracticable to use on a large scale, because sufficient quantities of manure cannot be obtained.

Commercial fertilizers will not do the work for the chief reason that they do not contain the humus, and organic matter, and for the further reason that the mineral matter in the soil is sufficiently dissolved by coming in contact with water and moisture to furnish the needs of plant growth. This dissolution is continued in sufficient amounts to keep up the necessary supply of minerals, and so the adding of commercial fertilizers will not, as a rule, add to the supply of plant food in the soil.

It is said that there is enough nitrogen in the air over an acre of ground to grow 75 bushels of corn per acre per year for 600,000 years, but the nitrogen is of no value to the soil unless it is drawn into it from the air, so that the plant in the soil can assimilate it into its system and thus secure the element that makes vigor of growth. But soils need humus and organic matter as well as nitrogen.

We are hearing much of the "Volusia soils," so named from a village in New York where first noticed.

A writer speaking of these soils says: "They are worn and unproductive, extend from the Hudson river westward across the state through Pennsylvania into Ohio. Ten million acres, most part too poor to grow clover without fertilizers, are unfit for cultivation. They once produced good crops; fine old houses and barns occupy them, which are now unoccupied. These lands dressed with liberal quantities of stable manure produce good crops. It is said that if these soils are drained, supplied with organic matter and their acidity corrected

so that bacteria can thrive in them, they become again productive. In fine, these soils need drainage, organic matter in the form of manure, green crops plowed under and application of lime. It is said that these lands cannot get manure because they will not support stock."

Are not millions of acres of our soil in other states of the Union becoming Volusiaized? And is not the secret of their restoration contained in the application to them of drainage and organic matter?

CHAPTER II

DRAINAGE

NO soil can be put in good tilth without thorough drainage.

As well try to grow most crops with "wet feet" as to attempt to grow them on hot desert soils. In both instances they will die, because they are out of their proper environment.

Moisture you must have to grow crops, but moisture overdone, un-does.

It is as necessary for plant roots to breathe as human beings; shut off soil ventilation and you shut off free oxygen from reaching the plant roots, and the plant dies.

There can be no soil ventilation when the soil is cold, compact and saturated with water. Hence the importance of drainage, and thorough drainage.

Drainage is of more importance to worn-out soils than it is to new soils. New soils are porous and water will easily percolate through them.

Worn-out soils are hard, compact and non-porous. They are absolutely incapable of affording ventilation to plant roots.

Drainage is one of the most effective methods of getting this needful soil ventilation.

The more drainage in worn-out soils the better; no matter whether water is on the land or not, put into them

as much ditching as you can. There is no danger of getting too many drains.

Ditches give the proper temperature to the soil, promote soil ventilation and conserve soil moisture.

Most heavy soils are compact and cold, the temperature in them is too low, and the soil ventilation too inadequate to be conducive to plant growth. There is no room in them for plant roots to perform their proper functions.

Lands improperly drained are slow in drying out, and seeding them is delayed beyond the proper season for planting, thus giving a shorter growing season.

It takes more labor to till cold, compact, non-drained soils. All kinds of soils are benefited by drainage.

Drainage, figuratively speaking, opens up the pores of the soils so that water from rains and snows will quickly enter and percolate through them, down to the drains rather than over the surface, preventing to a large extent the disastrous results of soil washing.

Drainage will also prevent the standing of water in the low places of our farms and thus eliminate the soured, heavy soils found in such spots.

The greatest advantage to be obtained by plenty of drainage is the putting of the soil in that condition of porosity, deepness and pulverization, as will prevent droughts as well as floods.

In a thoroughly ditched soil, plant roots at once strike deep where they are safe from the onsets of summer droughts.

The experience of years has been that well-drained

soils produce better crops in wet or dry seasons than the undrained soils, and experience has also shown that worn soils cannot be reclaimed until they are first well ditched.

In the light of this experience, I cannot too strongly impress upon my readers that we must first thoroughly drain our soils if we would build them up to a fertile stage.

All drains should be so constructed as to be open at both ends, as a drain so constructed will act like a chimney; the air will go into one end and out the other, and the air thus passing through the drain in dry weather is condensed into moisture, which is thrown out into the soil, made porous by drain construction, and thus furnishes moisture to the plant roots.

The source of all drains should terminate in some fence row close to the fence, the tile brought up to the surface of the ground and properly screened to prevent animals, weeds, sticks, or foreign substances from entering the drain.

The mouth of drains should be kept open at all times and screened in the same manner. Such a ditch is the most valuable asset on the farm.

Drains should be constructed of not less than six-inch tile, and need not ordinarily exceed four feet in depth, but no fixed rule as to depth of drain can be given, as the undulating character of the soil and the outlet must govern the depth. Where lands are too deeply tiled there is likely to be a waste of water.

In constructing drains, the idea of soil ventilation must be kept in mind, so it does not matter in all cases whether

a drain will carry water or not; it is useful if it only affords ventilation, provided both ends of the drain are open.

The Soils and Crops department of Purdue University Experiment station, in their experiments of tiled and untiled lands, show an average yield of 76.1 bushels of corn per acre on tiled land and 61.8 bushels per acre on untiled land, or a difference of 14.3 bushels in favor of the tiled land.

This is a money value of $7.15 per acre with corn selling at fifty cents per bushel.

This experiment speaks volumes for drainage and shows that a system of good drainage can soon be paid for out of the increased yield of crops which it will produce.

At a cost of less than six dollars per acre the author constructed a mile of eight and ten inch cement tile drain on his "Vetchfalfa Farm," and the larger portion of same was of ten inch tile placed at an average depth of six feet in order to secure an outlet.

This system of drainage installed by the author consists of one main line or outlet of ten inch tile, running through the center of the farm nearly one-half mile in length, with manholes provided with iron tops with openings for admission of water and air. Laterals are run out from both sides of the main line to the outer boundary lines of the farm and brought up to the surface of the ground close up to the fences and the opening screened to keep out trash or animals.

This method of tile drainage construction enables a surplus of water to quickly pass away and affords a per-

fect system of air passage in dry weather, the advantages of which has heretofore been shown.

In this system of drainage, cement tile were used because such tile are more porous than other kinds, and water and air readily pass through them.

PLOWING UNDER ORGANIC MATTER, VETCH AND CORN STALKS, WITH A DISC PLOW.

CHAPTER III

ORGANIC MATTER

IT is of great importance to crop production that there be plenty of organic matter in the soil.

I have shown why newly cleared soils were so rich in fertility — they are rich in organic matter.

Good authorities say that organic matter in the soil absorbs three times as much water as its weight in clay, and retains it twice as long, and five times as much as sand and retains it five times as long.

There is no danger of getting too much organic matter into the soil. An acre of land twelve inches deep weighs 2,000 tons. It would take 100 tons of organic matter plowed under every two or three years to make one-twentieth part of the 2,000 tons.

For a soil to be in its highest stage of fertility it must contain germ life and bacteria. These are always found in their greater abundance within the first six inches of soil, and they get their food from organic matter.

As they cannot get any feeding matter from the minerals of the soil, they cannot exist in any soil lacking in organic matter.

In virgin soils they are found in abundance, where they reach the highest stage of development.

This germ life and bacteria in the soil play an impor-

tant part in preparing the soil, or putting it in the proper condition for plant growth.

They are the little constant workers in Nature's laboratory, that compound and distribute the substances needed for plant food. They cleanse the soil of its offensive accumulations and are one of the best aids to successful agriculture.

It has been said that land without organic matter is but the skeleton of the soil, and that the organic matter makes the flesh.

The system of farming in vogue in the United States for the past one hundred years has farmed out of the soils most all the organic matter originally in them. It has stripped the body of its flesh and nothing but the skeleton remains.

For instance, the average farmer will one year plant a field in corn. The next season he will break, rake and burn every stalk and put it in corn again. In the fall he will sow wheat in the corn. The next season he will break the ground and put in wheat again; perhaps he will sow clover in the wheat in the spring. If the clover is a good stand, the next season he will remove from the field not only the first clover crop but also the seed crop, and the following spring break up for corn again, and continue on and on this same process.

This is regarded good farming. They tell us it is crop rotation, and builds up our farms. Yet I say to you, that under this very system our farms have grown and are growing poorer every year. That the organic matter in the soil is becoming less and less, and why?

Because not sufficient organic matter is being added to the soil to keep up the necessary supply.

The corn stalks were in the majority of cases burned and destroyed; the wheat stubble with its roots was insignificant. Both crops of clover were removed, leaving nothing but stubble and roots, which are insignificant.

In all these years more organic matter was removed than added to the soil, and the supply of humus was gradually being exhausted.

What about the fields that have been planted each year to corn for ten, fifteen, twenty and even seventy years, and stalks removed and burned each year? And what about the many fields rotated with corn, oats and wheat only, and the stalks and stubbles in most cases burned?

Vegetable matter destroyed by burning resolves into air from 90 to 99 per cent. of its organic parts.

If this be true, then the value of the ashes obtained from burning vegetation is too small to be considered.

Standing in the receding twilight of an April evening, I have seen the entire visible horizon of the famous Wabash Valley aglow with the reflection from the fires of burning corn stalks, raked up into windrows, from thousands of acres of soil, that needed the humus, potash and nitrogen abounding in these stalks, but which was going up in smoke, to be lost forever to these acres of soil that are fast losing their fertility. As I looked upon this thoughtless and almost criminal destruction of soil fertility, I saw in my imagination pictured in the reflected light upon the sky, pictures of

"Agricultural Bankruptcy" and "Abandoned Farms," and as I beheld this pictured doom of the American farm, I exclaimed: When, oh when, will the American farmer come into a realization of this awful destruction of soil wealth?

One day in the spring of 1909, while directing some work on my farm, I noticed to the north great clouds of smoke and flame covering a large area. I wondered what could be burning. The conflagration was too large for burning corn stalks or buildings. Later in the day I learned that a farmer (?) had touched a match to a forty-acre field of dry Big English clover grown on the ground the previous season and left uncut.

When I learned of this conscienceless destruction of soil fertility, I said in my wrath: The match in the hands of the American farmer is a menace to the farm.

In the growing of this clover and leaving it uncut to cover the ground through the leaching season of fall, winter and spring, this farmer had taken the first and an important lesson in soil restoration. But his second and best lesson was left unlearned.

Think what it would have meant to that soil and that farmer had that splendid crop of organic matter, so full of the precious soil elements, nitrogen and humus, been turned under by the plow.

Think how the little rootlets of the corn would have reveled in this mass of organic matter, mixed with the soil and drawing from it into the corn system those elements that make that sturdiness of growth that produces a heavy paying crop on the farm.

Again, think of the financial loss to that farmer from

the destruction of the clover. For it has been estimated that the potash, phosphoric acid and nitrogen in a ton of clover hay is worth $17.57 for manure. There was not less than a ton of clover hay on each acre of the forty-acre field, worth a total of $702.80 plowed under for manure.

The farmer's only excuse for burning was that the clover was so heavy that it could not be plowed under. This we dispute. The right kind of a double-disc plow would have turned it under nicely. Of course the plow would have occasionally choked up, and it would have taken longer to plow the field, but it would have been well worth the time and extra labor, for the farmer would have secured for this field a fertility that would have yielded him large returns.

The same excuse that this farmer made for burning the clover, is made for burning corn stalks; that is, they cannot be plowed under so as not to interfere with the cultivation of corn and other crops. This we also dispute. We have turned under the rankest kind of growth of corn stalks that never were pastured, with an ordinary walking plow and log chain. Of course, some stalks were left sticking out of the ground and in the cultivation of crops an occasional hill of corn was jerked out of the ground by the cultivator catching on the stalks insufficiently plowed under, but what of that? The loss of a few hills of corn is nothing compared to the great loss of the stalks if destroyed by burning.

An instance is given of two farmers owning farms side by side, one of whom always gathered up his corn

stalks and burned them. The other never allowed a stalk or a straw to be burned on his land. After fifteen years the former farmer's farm yielded fifteen bushels of corn less to the acre than when he first commenced farming it, while the latter's farm produced as well as it did at the beginning of the fifteen years.

One hundred bushels of corn contains about 100 pounds of nitrogen, 17 pounds of phosphorus and 19 pounds of potassium.

The stalks upon which the 100 bushels of corn grew contain about 48 pounds of nitrogen, 6 pounds of phosphorus and 52 pounds of potassium. All these elements in the stalks have a money value of $11.04.

These elements in the corn itself are lost to the soil if the corn be sold, but that in the stalks can be saved to the soil if the stalks are not burned but are plowed under.

In the black prairies of Illinois and Iowa and the rich river bottom lands of Indiana, are vast acres of land that used to produce an average crop of sixty or more bushels of corn to the acre. The average is now less than forty bushels to the acre.

The virgin richness of these lands could have been continued simply by the plowing under of the corn stalks grown on them.

The American farmer must learn the lesson of getting organic matter into his soil or his farm is doomed.

We must learn the lesson that the restoration of organic matter to the soil is the only way to increase its crop-producing power.

That no soil is complete without it. That the very

nature of organic matter is to bind the soil grains together, absorb and hold large quantities of moisture, prevent the washing and blowing of the surface, besides furnishing the food for bacteria and depositing into the soil nitrogen and other needful soil elements.

When we have well learned this lesson, then will our farms be freed from the curse of worn-out soils.

Nature understood her business when she covered our lands with forests and the vast prairies with large growing grasses, so that the decay of tree trunks, limbs, leaves and grasses would intermingle with the sand and the clay and thus produce the rich lands for the farmer, but the farmer has not learned the lesson that when he gets away from Nature's ways of soil building he is heading towards the doom of soil exhaustion.

We are so apt to do things as our fathers did, forgetting that our fathers lived under different environments than we do.

The pioneer farmer had the soil in its original freshness and had no need of building it up. It was rich enough. The children were by this pioneer, who was not bound by any necessity of a change of farming methods, taught the simple lesson of farming just as he did.

But when the land fell into the inheritance of the children's children it had almost reached the point of soil exhaustion, and the children's children being bound with the cords of environment, lacked sufficient will or mental power to break them, and kept on farming as their fathers did, thus showing the great strength and influence of environment.

It is said that in the magic transformation of dirt on the farm into dollars no one is robbed. True — if the one who touches the soil with the magic wand is not a soil robber. But the wand in the hands of a soil robber plunders all mankind alike, and as some one has said in thought, Mother Earth, resenting the infamy heaped upon her and her people, bears the pain in silence but inflicts the awful punishment that falls on all alike, by withdrawing her bounty.

A FINE CROP OF ORGANIC MATTER FOR PLOWING UNDER.

If after the corn has been harvested the corn stalks are not pastured, and the vetch shown between the corn rows has passed through its fall and spring growth, there will be a fine lot of organic matter for plowing under, which will greatly aid soil ventilation.

CHAPTER IV

SOIL VENTILATION

I HAVE said something of soil ventilation and that plants cannot thrive without it. I have also said that plant roots must breathe or the plant will die.

If soil is so compact that air cannot enter it, the plant is injured as much as if it had no water.

Entirely exclude oxygen from seeds placed in the soil and you get no growth. If you have some ventilation but not enough, then you have the sickly plant. It is said that "a plant lacking in root breathing is drowned as effectively as an animal would be under water, because enough free oxygen cannot reach them." Insufficient ventilation resulting from poor drainage destroys organic matter in the soil.

Sufficient soil ventilation produces the necessary nitrates in the soil and prevents their destruction as well.

Air must penetrate deeply into the soil, and the passage of the air must be both in and out of the soil.

Soils underlaid with coarse gravel, sandy and light soils, are generally strong on ventilation, while compact clay and heavy soils are short on ventilation.

Soil is said to be a living thing. But it is only alive when it is full of organic matter and porous veins, so

that it can breathe from the air the gases needed by the plant root.

Tuberculosis enters our insufficiently ventilated homes and soil exhaustion enters upon the compact, non-porous soils.

We must ventilate our homes if we live, and this is as applicable to the soil as it is to man.

Soil ventilation can be secured by drainage, deep tillage and plowing in, of course, organic matter. Certain plants, like the alfalfa plant, penetrate their roots deep into the soil and when they decay leave openings into which air finds its way. Next to drainage, soil ventilation is best secured by the plowing under of heavy crops of organic matter, such as corn stalks, rye, vetch, buckwheat, hungarian, clover, etc.

It must not be forgotten that a soil filled with water cannot possibly breathe, neither can a close, compact soil, so a soil may be fairly well drained and yet not be properly ventilated; hence the need of organic matter to aid in soil ventilation.

The necessity for soil ventilation is not only that oxygen may come in contact with the plant roots, but that a proper home may be established in the soil for the vast multitude of bacteria, so that they can perform their work of changing the nitrogen of decaying organic matter into a form suitable for plant food.

It seems that bacteria in the soil are affected by environment as well as man, so conditions of the soil will influence and modify their growth.

Soil bacteria being essential to a good, living, working soil, then we can see the need of effective soil ventila-

tion so that the soil may be put in that condition that these bacteria may best develop and flourish.

When soil is in such condition it can be truthfully said that it is indeed a living thing and is only in the proper condition to give its best service in growing crops for the farmer.

NATURE'S PLOWS AND CULTIVATORS AT WINTER REST.

In the growing seasons of the year if we could see into the soil covered with the forests, we would see the roots of trees shooting out and down into the soil as animated beings, and, as they grow in size, we would see the soil loosened up by their action, and the pushing this way and that way of the roots and rootlets stir the soil more effectively than if stirred by the plow.

CHAPTER V

PLOWING

THAT proper plowing is one of the most important steps in soil building is apparent on close study.

That soil is improved by stirring is a truth only denied by the ignorant and unobserving man. It is one of Nature's ways of aiding in soil building. The plows and cultivators of Nature are the roots of trees and plants.

In the spring and growing seasons of the year, if one could see into the soil covered with the forests and vegetation, he would see the roots shooting out and down into the soil as animated beings, and as they grow in size he would see the soil loosened up by their action, and the pushing this way and that way of the roots and rootlets stirs the soil more effectively than if stirred by the plow.

This observation of one of Nature's ways shows the importance of soil stirring.

I claim that soil should be stirred frequently. If it were possible to break up soils several times a year, their fertility would be increased.

It is one of Nature's ways to be busy. She is never idle. Nature will not allow soil to be idle, except in the winter season.

If soil is not occupied with growing crops, then Nature starts the weeds and grasses to occupy and cover the soil, and from this an important lesson is to be learned in successful soil cultivation. Keep your soil occupied with some useful crop. It takes as much plant food to grow weeds as to grow corn. Then why not plow or stir our ground after a crop is removed and plant to some crop of fertilizing value, and secure the great benefits of weed eradication, soil stirring, organic and fertilizing matter.

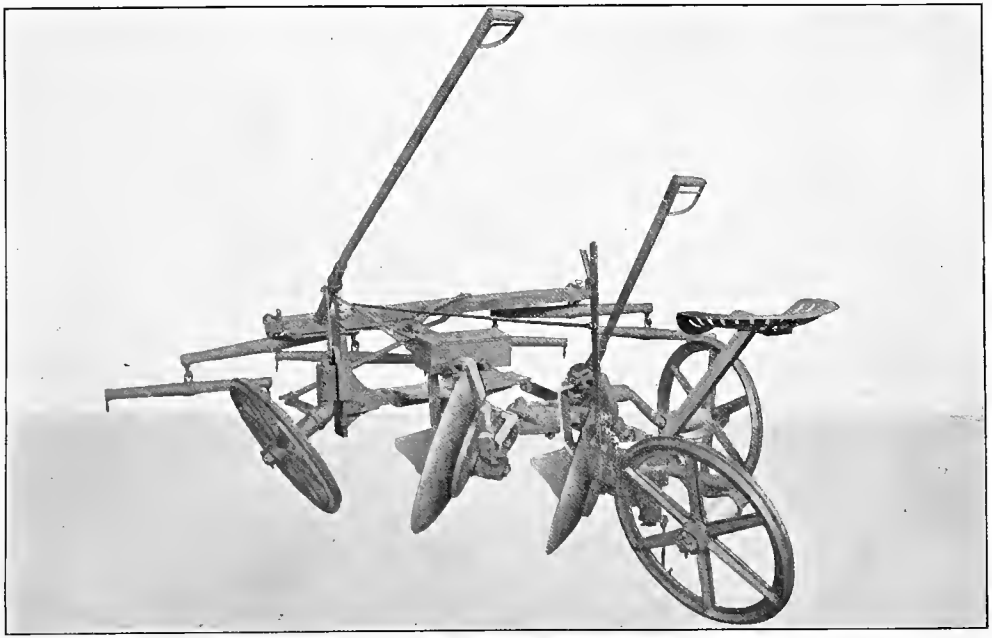
It is said that "tillage is a manure," that "frequent tillage is our best and cheapest manure," that "tillage and manure are one and the same thing."

Old Rome was once noted for its high state of agriculture, and the old Roman farmer plowed his land never less than three, and some times nine times for a single crop. And after the dark ages the Flemish farmer was a strong believer in frequent pulverization of the soil. And upon this principle England has constructed an agriculture that reclaimed her worn-out soil and made it increase its productive power nearly fourfold.

Plowing and stirring the soil mixes the organic matter with the minerals in the soil, affords better ventilation, gives the soil better ability to store up and deliver moisture to the growing crops, and gives more room for the plant roots to perform their proper functions.

There is a time to plow and a right and a wrong way to plow.

The plowing or stirring of ground, no matter what



A DOUBLE DISC PLOW.
(Courtesy Long & Allstatter Co., Hamilton, Ohio.)

its character, when too wet is a crime against Nature's laws, and punishment follows, quick and sure.

The passing of the plow through the soil presses the soil grains together until the soil turned over becomes dense and impervious to water or plant roots. The soil thus turned over becomes like unburnt bricks dried in the sun, and ventilation is completely shut off. Its usefulness as a home for plant roots is destroyed.

And even if the surface soil be sufficiently dry but the subsoil too wet, the passing of the plow through the soil will press the soil together under the plow and we get a compact stratum of earth below the top soil which will hold water above it and prevent moisture rising when needed.

All this shows the importance of plowing at the right time and with the right kind of plow.

There has been great evolution in breaking plows; we have many kinds and makes. The writer has tested all kinds and is convinced that the disc plow is the best of all.

A disc plow will plow soil that no other plow will. It is the only plow that will successfully turn under corn stalks and heavy masses of organic matter and thoroughly incorporate it into the soil.

The furrow slice plowed by a disc plow is broken off from the soil below, thus preventing the pressing together of the soil grains.

Any other kind of a plow in passing through the soil smooths or slicks the bottom of the furrow slice, and the bottom of the furrow, which interferes with soil ventilation and the rising of moisture.

A disc plow does not throw the soil from the bottom of the furrow slice on top. It stirs and loosens the soil to the depth plowed, completely covering all organic matter to be plowed under, yet does not bring the subsoil to the surface; so it is always safe to plow any depth possible to be plowed with the disc plow.

The disc plow pulverizes the soil as it turns it over, which no other plow will do, and its draft is lighter.

When the author began to use double disc plows on his farm, using three horses only, and plowing two twelve inch furrows an average depth of eight inches, the neighboring farmers characteristically condemned them at sight, denouncing them as "horse killers." And though he continued to use them several years, yet these farmers took no pains to investigate their merits and continued to condemn. But the author knew their merits and paid no attention to the farmers' comments, and after using them several years, one spring he employed a neighbor negro farmer to plow for a few days. The negro came to work at noon with two horses expecting to hitch to a walking plow. The author gave him one of his horses and directed that he hitch it with his two horses to one of his double disc plows then standing in a field where it had been in use, and also telling him that the plow was properly adjusted and all he had to do was to just plow. The author then walked off, noticing however, that the negro looked as though he wanted to make some objection or protest. The author returned in the evening just before quitting time and the following conversation took place:

(Author)—" Well Harvey, how have you been getting along since I've been gone? "

(Negro)—" Fin', sah! Fin', sah! Say, Boss, dey's don' bin lyin' 'bout dis plow."

(Author)—" Why, Harvey, it is strange that any one should lie about an innocent looking plow like that, I don't see how they could tell anything bad about it."

(Negro)—" Well, dey's bin lyin' 'bout dis plow and a sayin' dat it is a hoss killer."

(Author)—" Well, Harvey, has it killed your horses? "

(Negro)—" No, sah! It hain't no hoss killer, it don run too easy fer dat."

I have plowed with a disc plow in the fall of the year, black gumbo soil so hard that a steel walking plow could not be made to enter into it, and I have with a disc plow turned under weeds higher than the horses' backs so nicely that a single weed could not be seen in the field. And with it I once turned under a field of hairy vetch, heavy in foliage, after having tried all other kinds of plows and failed to make them do the work. I once plowed a strip fifty feet in width around a ten-acre field and then finished breaking the balance of the field with walking plows. The field was planted in corn, and during the entire season the corn on the strip plowed with the disc plow was more thrifty than the rest of the field and at least a foot higher, and produced more and better corn.

How deep shall we plow? Poor Richard said:

> " Plow deep while sluggards sleep,
> And you shall have corn to sell and keep."

But was Poor Richard exercising the right of poetic license, which allows one to measure thought in verse although the truth sought to be conveyed be far fetched?

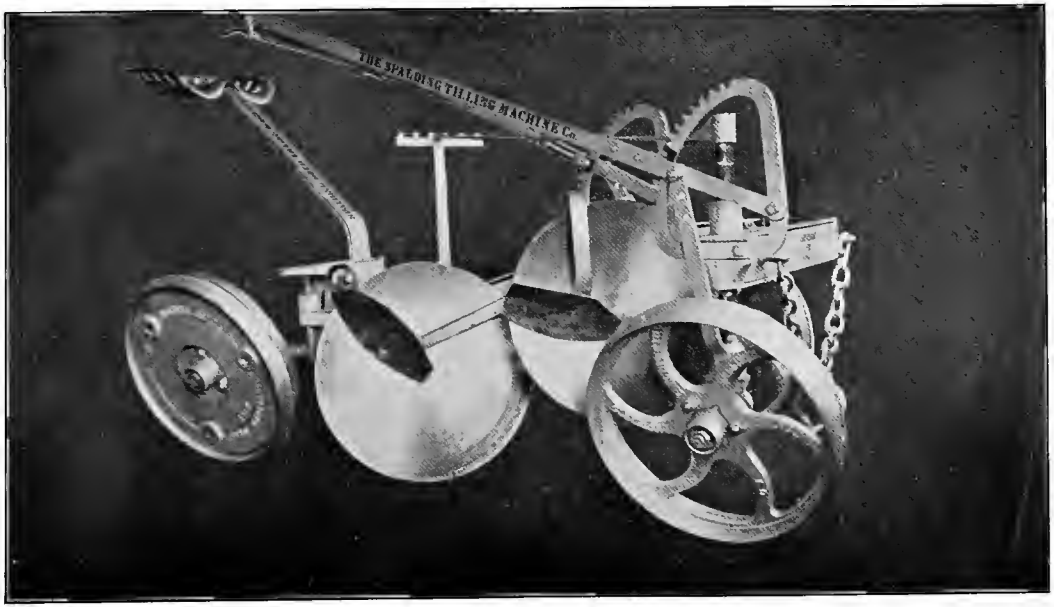
In determining the depth to plow, it is well to first consider why we plow at all.

It must be conceded that the object to be secured in plowing is to obtain a seed bed most favorable for plant growth and development, and such a seed bed is one that will hold sufficient moisture, air and heat, so that chemical and germ action will take place therein, that plant food may be prepared for the growing crops.

There must be sufficient room for root development. And a deep seed bed well filled with organic matter will so increase the storage capacity of soils for water, and so reduce the effects of evaporation, that a sufficient quantity of moisture will be secured to bring the crop to maturity, no matter how dry the season may be.

A shallow seed bed cannot possibly hold sufficient organic matter, moisture, air or heat, to meet the needs of growing plants. A study of the corn root system ought to convince any one that a shallow seed bed does not meet the requirements essential to good corn growing. A larger space must be given for the roots of most any plant.

If your soil, below the depth to which it has always been plowed is close, compact, or hardpan, the roots of plants will not penetrate it, nor will they secure sufficient moisture. The deeper the seed bed the more room for plant roots and the greater the supply of plant food and moisture.



THE SPALDING DEEP TILLING MACHINE.

(Courtesy Gale Manufacturing Co., Albion, Michigan.)

One enterprising farmer in the Lima Bean belt of California, after studying his soil concluded it was a mistake to merely scratch the surface as most farmers were doing. So he put his plows down twelve inches and got under the hard soil underlying the usual plowed surface.

By plowing this depth he gave his beans double depth for their roots to grow and get nourishment. This they could not have gotten in a shallow seed bed. He almost doubled his crop.

A demonstration of plowing to a depth of twelve to fifteen inches in the Yazoo Delta, Louisiana, in 1906, without the use of fertilizers, increased the yield of corn from fourteen to seventy bushels per acre.

And numerous demonstrations and experiments of deep plowing throughout the South, made within the last few years, have led to the conclusion that deep plowing supplemented with drainage and plenty of organic matter, is the true method of building up and maintaining soil fertility.

In ancient times the Romans plowed to an average depth of nine inches.

The Flemish farmers plowed deep, and the chief stone in England's foundation for an improved agriculture was deep plowing and soil pulverization.

The Orangeburg fine sandy loams found within the Atlantic and Gulf Coastal Plains from Southeastern North Carolina to West Central Texas, are freed to a great extent from the danger of erosion by deeper plowing supplemented with the use of organic matter.

For years it was the custom to plow these sandy

loams not over three inches in depth. In later years it has been found that by plowing to a depth of eight to nine inches that crop yields have been greatly increased.

One third of the author's "Vetchfalfa Farm" is a sandy loam, the subsoil being a yellow sand ranging in depth from three to twelve feet with gravel underneath.

When the author first came into the possession of this land he was cautioned to never under any circumstances plow it to exceed four inches in depth or he would "kill it."

The author concluded that there was nothing that would pay him so well as to become closely acquainted with his own soil. So he got next to this sandy soil and studied it. He found that below the plowed depth the soil, even though it was pure sand, was so packed that air could not enter it and plant roots and moisture penetrated it with difficulty. He then concluded that there could be no danger in plowing this soil deep so long as the yellow sand below was not thrown up on the surface by the plow. So in the spring of 1910 he decided to "kill" the poorest tract of his sandy land and ordered the disc plows to be set to plowing as deeply as possible, plowing under a heavy crop of organic matter. This tract was planted to field corn as late as June 3d, yet made seventy-five bushels of corn to the acre, which was more than double the crop that had been gathered from this land before the author purchased it.

Rye was sown in this tract in the corn in the fall of 1910 and in the spring of 1911 the corn stalks and rye were plowed under and as deep as the disc plows

PLOWING UNDER CORN STALKS WITH DEEP TILLING MACHINE.
(Courtesy Gale Manufacturing Co., Albion, Mich.)

would plow it, and the land planted in sweet corn. And notwithstanding the fact that the summer of 1911 was the driest and hottest experienced for years, this corn made a profitable crop and a better crop than the best bottom land on "Vetchfalfa Farm."

By deep plowing, supplemented with the plowing under of heavy crops of organic matter the author is making his sandy land the best land on his farm.

Under the direction of the author, experiments of deep plowing of stiff clay lands with a disc plow have been made for the past three or four years, and astonishing crop yields have resulted.

There has recently been invented a disc plow called the "Spalding Tilling Machine" which will plow any depth up to twenty-four inches and so plows, mixes and pulverizes the soil as not to bring any of the soil from the bottom of its furrow to the surface, yet will completely turn and cover a sufficient depth the heaviest mass of organic matter. The author will begin the use of these plows the coming season, believing them to be the most valuable tool any one can have upon the farm.

In the first edition of this book, in the chapter on plowing, the author said, "Drain well your soils, plant in them crops for green manures that send their roots deep down into the soil, then it will only be necessary to plow your soils deep enough to well cover the organic matter plowed under."

This was safe advice and in the use and application of which no one could go wrong, but subsequent extensive experiments have shown the author that not every

green manuring crop will send their roots much below the plowed surface; that the deeper the seed bed, the greater its capacity for root growth, holding moisture and compounding plant food; that so long as the proper plow is used in plowing no danger can result in deep plowing, but rather will your crop yields be materially increased.

Tull, an agricultural writer, claims that by thoroughly pulverizing the soil its fertility can be permanently maintained; that by repeated plowing he produced twelve successive large crops of wheat on the same land without manure.

Supplement Tull's system of frequent plowing and pulverizing the soil with deep plowing and the turning under of plenty of organic matter and you have the secret of building and keeping up the fertility of the soil.

A FINE SOIL COVERING — WINTER RYE AFTER CORN — JUST BEFORE WINTER.

Note the large growth of rye. This will protect the soil from washing by the winter rains, afford the finest soil covering, and give an abundance of organic matter.

CHAPTER VI

SOIL COVERING

TOO much stress cannot be laid upon the importance of doing that to your soil which will keep it covered during the season of fall, winter and spring, which is known as the leaching season.

Terrific is the destruction each year to soil by leaching. Stand by our streams and rivers during their floodtides and see the thick consistency of their waters made so by the heavy rains that fall upon the soil, mixing and dissolving its particles of dust and litter.

Hillsides and valleys are swept of their soil by the rapid washing of the waters, which, as stated, occurs more frequently in the rainy season.

Soils covered by, and filled with, close-lying herbage and thickly rooted plants will not wash or wear away under the action of falling water, neither will such covered or root-filled soils be blown away by the winds.

If an estimate could be made of the soil wealth carried away each year by the waters falling from the clouds and washing away over our fields into our streams and rivers to the sea, and by the blowing of the winds, it would be appalling.

The remedy to check and preserve this flow of soil

wealth to the sea, is keeping our soil, when not occupied by growing crops, covered as much as possible with the herbage and root-producing plants of rye, vetch, etc.

Covering the soils with these crops prevents puddling of the soil. The growing and decaying of the roots aids in depositing the minerals and in bringing about the changes characteristic of new soils.

The open, mellow texture of the soil is produced by covering.

Naked, clayey soils, subjected to excessive rains, followed by drying winds and rapid water evaporation, forces them to crack open and their texture is thus injured. If such soils are covered, they are not subject to this process.

It has been observed that when soil is covered with any kind of close material for any length of time, it is so enriched that one would think manure had been applied to it. Even snow lying on the soil for months enriches it.

I have already shown that the reason virgin soil was so rich was on account of the ages of covering Nature gave it.

In the humid region it is noticeable that, if a fence row is neglected, it will first grow weeds, then grass, then the different species of trees native to the neighborhood. That, if after the course of only a few years the fence row is cleaned out and again brought into cultivation, it will be found that the soil is rich and that it will again produce abundantly.

Some will argue that the reason of this is that the land has had a period of rest, forgetting the fact that

a soil works hardest when it is growing weeds, grasses and trees.

An observer of Nature sees a great lesson in the neglected fence row. It demonstrates Nature's way of soil covering, soil building and soil restoration.

When the land occupied by the fence row was no longer cultivated and was neglected and for the time abandoned by the farmer, Nature took it in hand for rebuilding and first prepared it for the growing of grass by the growing of different kinds of weeds which filled and covered the soil with the decayed roots and tops.

The grass came, whose roots and tops furnished additional organic matter and provided a soil covering that gathered and retained the nitrates.

Then the little trees came which stirred the soil with their rapidly growing roots. Some of the weeds, grasses and trees were of the legume family and so stored the precious nitrogen into the soil.

The roots of the weeds and trees went down deep into the soil and brought up potash and other minerals which were stored into the leaves, branches and trunks, to be transferred to the soil when they fell down on the soil and decayed. In this illustration we have all the lessons of organic matter, soil stirring, soil covering and their importance in restoring worn soil.

The secret of soil covering in promoting soil fertility lies in the fact that covered soil prevents ammonia wastes from the soil by evaporation, and the loss of nitrogen.

To preserve soil fertility, it must be kept covered as

much as possible, yet the system of farming mostly in vogue in America is to strip the ground of every vestige of matter, expose it to the heat of the sun and the washing of rains.

Soil covering is an important lesson we American farmers must learn.

If, after our fields of corn were laid by we would sow them in rye or vetch, and when corn is harvested roll down the stalks, all to be covered with the snows of winter, and no stock allowed to pasture upon them, what a wealth of fertility would be gathered under this covering during the leaching season.

What a mass of rich material to be plowed under to mix with the fertility produced by the covering during the season of rest.

But how does the average American farmer treat his cornfields? They are laid by without any green crop planted, the corn is gathered and then his herds of cattle and horses turned into them; and the fields are stripped of their precious coat of organic matter, the soil is ruined by the tramping, puddling and exposure to washing rains and baking sun.

The only exception is when corn is followed by wheat, and then too often the fields are pastured to their great injury. If a farmer has a stack of straw, he will either burn it or sell it, instead of spreading it on his soil, which would bring him more money than the few dollars he gets for it, and if he burns it he has gained nothing.

I wish I could burn it into every American farmer, that he must cover his soil if he would keep up or increase its fertility.

A YOUNG VETCH PLANT SHOWING NITROGEN NODULES ON ITS ROOTS.

Taken from the soil in January. Note large number of branches shooting out from the main root stem. The stems were more than a foot in length.

CHAPTER VII

HOW TO PRODUCE AND GET ORGANIC MATTER INTO THE SOIL

IN the preceding chapters I have endeavored to make it clear that worn soil cannot be reclaimed, or the fertility of any soil cannot be maintained, without the liberal use of organic matter. Any system of farming that does not have for its corner stone the liberal use of organic matter is a "delusion and a snare," and will lead straight to the worn-out abandoned soils.

I have shown that the use of organic matter was Nature's way of soil building and so it must be our way of soil restoration.

The use of organic matter being of so much importance in aiding and securing complete drainage, soil ventilation, furnishing food for soil bacteria, and in the general building up of all soils, then how are we to produce and get organic matter into the soil?

Nature has, indeed, done her part in furnishing a great multitude of plants that furnish organic matter in abundance. Her garden seems to be full of them, and it is up to man to do his part and select from this great storehouse of wealth the plants that will serve him best for this purpose.

While it is conceded by the majority, that manure is the best organic matter that can be put into the soil, yet we must not forget that the average farm produces but a small quantity of manure, not one-tenth part enough to keep up its fertility. That the average farmer does not have sufficient means to keep sufficient stock to furnish the supply of manure needed to rebuild or maintain fertility of his farm.

And we must not forget that worn-out and abandoned soils will not produce enough food to feed a sufficient number of animals to produce the requisite amount to restore their fertility.

While the author has been a liberal user of manure upon his worn soils, yet for years he has felt that there is some element lacking in manure that seems to be supplied by the use of green manures. Just what that element is he does not know, he only knows that he gets better results from the plowing under of those crops that are best for green manuring than he does from the use of ordinary barnyard manure.

It is said by a high authority that "as an average, animals digest and thus destroy two-thirds of the dry matter in the food they eat, so that one ton of clover hay plowed under will add as much humus to the soil as the manure made from three tons of clover hauled off and fed, even if all the manure is returned to the land without loss of fermentation."

All the liquids of any value in barnyard manure originally came from the plants and grain fed to stock and these liquids are the most valuable part of manure.

In the usual methods of handling manure nearly the

whole of this liquid is allowed to go to waste. Does not this explain why the author has gotten better results from the use of green manure than from the use of barnyard manure? In the use of green manures he has saved all the valuable liquids which the green manuring plants assimilated into their roots and branches during their growing season, and has also saved two-thirds of the dry matter in these plants and thus secured a greater supply of organic matter for bacteria food, and supplying humus for the soil.

But notwithstanding this, the author advises the use of all the manure you can get, and do not forget to spare the match and plow under for a supply of organic matter all cornstalks, weeds, stubble and straw. To get a further supply, we must make certain plants subserve our purpose, and in subsequent chapters the author will describe the virtues of some of those plants which he thinks are best adapted for producing organic matter.

However, there are many others of great value, like the Canada field-pea, soy bean, cowpea, buckwheat, turnip, Dwarf Essex rape, alsike and crimson clover, velvet bean, corn sown thick, white mustard, etc.

Leguminous plants are best for green manuring, because of their power to draw vast quantities of nitrogen from the air; but there are many non-leguminous plants that are valuable for furnishing organic matter and soil covering.

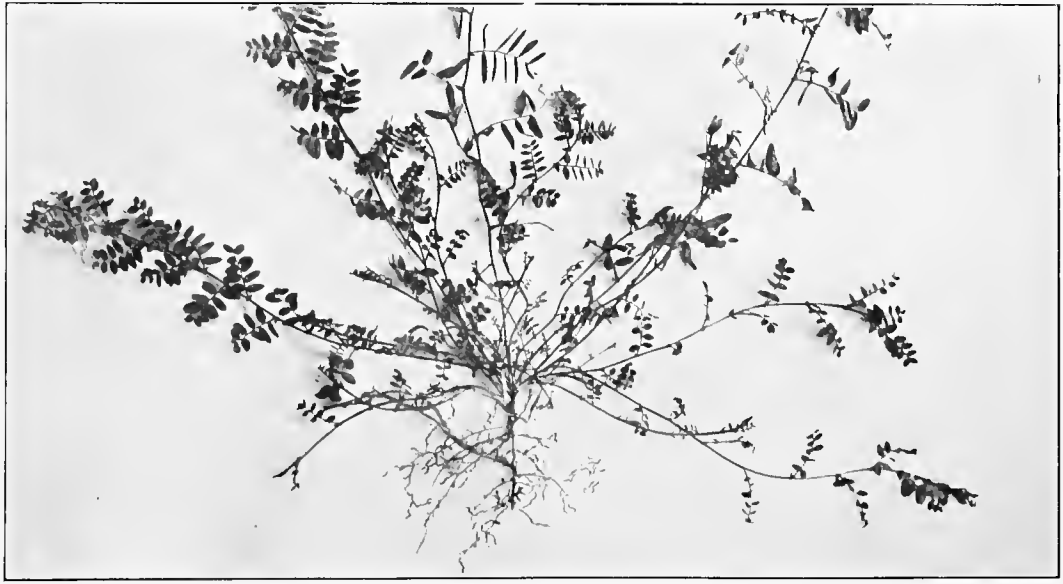
The ideal plant for furnishing organic matter is the one that can be planted in the fall of the year, and which will make sufficient growth to cover the ground during the winter season, and fill the soil for a consider-

able depth with its roots, and if this ideal plant is a nitrogen-gathering plant so much the better.

When organic matter has been produced, that portion of it other than the roots of the plants can best be incorporated into the soil by the use of a plow like the disc plow or the deep tilling machine.

It is important that organic matter be put into the soil in the right manner to prevent the ill effects of "soil roofing" or soil cavities between the bottom of the furrow slice and soil turned under.

But if the plows above mentioned are used and the soil is well rolled and worked down with harrow or disc there will no effects from "roofing."



VETCH PLANT GROWN FROM SEED PLANTED AUGUST, 1909, AND TAKEN FROM HARD FROZEN SOIL IN JANUARY, 1910.

This plant had been subjected to a temperature of 17 degrees below zero, yet was fresh and green and showed no effects of the severe freezing it endured.

Note the large four-pronged nodule on end of main root stem. On account of hard frozen ground most of the roots of the plant were broken off in getting it from the frozen soil.

CHAPTER VIII

RYE

EXAMINE the rye plant and its roots in the early spring and you will find the soil completely covered with the foliage of the plant, and the soil for six or more inches in depth a perfect mass of roots. Plowing rye is like plowing grass sod.

The rye plant covering the soil during the winter season prevents the disastrous leaching that occurs on soils not covered. The foliage and roots give organic matter and ventilation to the soil.

It is said on the best authority that green rye is equal, ton for ton, to stable manure, with one small exception. Manure has half a pound of phosphoric acid per ton more than rye.

In a ton of green rye there are eleven pounds of nitrogen, four and one-half pounds of phosphoric acid and twelve and one-half pounds of potash. A ton of green clover contains only twelve pounds of nitrogen.

Rye sown early in the fall will by May 1 produce five to fifteen tons of rye to the acre. This plowed under on that date would give you, compared to manure, a money value of $10 to $20 per acre procured at an expense of less than $2 per acre. In addition to its manuring value, it can be grown at the time of the year when much of your soil is not occupied with other crops.

It is a protection to fields liable to washing. It absorbs certain useful minerals and acids that otherwise would be lost to the soil.

One writer, speaking of rye, says: "The labor of applying evenly forty loads of manure per acre is considerable. All this is done more evenly by the green crop. Seed and labor together cost me but three dollars and a half per acre. I cannot say that it adds as much fertility to the soil as forty loads of manure, but I do say that in our droughty seasons it produces as great an increase of crop as do forty two-horse loads of good manure. It certainly pays to practice it, and to practice it largely, even on the land well supplied with stable manure."

In the fall of 1907 I planted rye in corn. The fall was the dryest we had had for years, but notwithstanding the extreme drought the rye made a splendid growth before winter and covered the ground. Some of the rye was plowed under quite early in the spring, and some on high rolling ground was not plowed under until it was heading. The entire field was planted to sweet corn. In breaking the field the soil broke and turned over as a sod field would. The soil was loose and friable, and a splendid crop of sweet corn was grown. The corn grown on the higher and rolling portion of the ground and which was plowed when the rye was in head produced more per acre than the remainder of the field, and yet this portion of the field was the poorest.

I had another ten-acre field, which I also planted to rye in the fall of 1907. This field was subject to much

washing, but the rye covered the ground so completely before winter that no portion of the field was washed. In the spring I early plowed this field and sowed it in peas for a canning factory. The peas were harvested July 7th, 8th, and 9th. After the removal of the peas I disced the field and July 15th sowed to hungarian. September 6th I began cutting the hungarian for hay. It produced three and one-half tons of splendid hay per acre, equal in feeding value to any hay, except alfalfa, grown on the farm.

On the 20th of September with a disc wheat drill I sowed the field to rye without any preparation of the soil. By December 1st the field was a solid mass of green rye. This field I broke early the following spring and planted to field corn, and the field was in splendid tilth for same, and made eighty bushels of corn per acre.

In growing rye for fertilizing purposes most farmers make the mistake of pasturing it too close in both fall and spring. In no case should it be pastured in the spring. Allow it to grow as long as you can. You cannot have too large a growth to plow under. Some may tell you that if you allow it to get too large and plow it under it will so dry out the soil as to injure the growing crop. But do not believe it. Heavy vegetation plowed under is a conservator of moisture.

Some will also tell you that it sours the soil. Your soil is sour only when it is cold, wet, non-ventilated and unproductive. Ditch and get the water out of it, plow into it large quantities of vegetable matter, produced from green manuring plants, and thus start up the

circulation of air into it, and it becomes warm and sweet.

Soil is never soured by plowing under green crops if it is well drained, and is thoroughly rolled and pulverized.

Next to draining and ventilating, sour soil needs feeding organic matter. A fertile soil is never sour.

While rye is one of the most valuable of forage plants, yet it is equally as valuable for fertilizing purposes. If your soil needs cleaning, sow rye. It gathers food in the soil and makes fine growth on poor soils. It is especially adapted to sandy lands and will grow well on stiff clay lands if they are well drained.

The author knows of a farm that has been restored and built up with rye until it produces the best corn crops of any farm in the neighborhood. The owner always sows rye for plowing under for his corn crop. His rye crops plowed under helped his land in holding moisture in dry seasons, which, as I stated, is contrary to general belief.

The farmers have a wonderful weapon in rye to aid in combating soil exhaustion, and it is so easily and cheaply grown. From one to two bushels of seed at a cost of from 70 cents to $1 per bushel will seed an acre, and the labor and cost of seeding in corn or after wheat is insignificant.

We who are sentimentally inclined delight in the melodies of the Scottish love lyric, "Comin' Thro' the Rye," humming its words:

> "If a body meet a body, comin' thro' the rye,
> If a body kiss a body, need a body cry?"

We wonder whether the Scottish bard was singing of the rye plant or of the River Rye and its stepping-stones o'er which the Scottish maidens were wont to pass, for if he was singing of the rye plant we can picture in our imagination the lovely scene of a field, rich in the beautiful growth of the majestic, blooming rye plant, whose foliage hid the blushes of the Scottish maiden when met by her stalwart lover, " Comin' Thro' the Rye," who claimed the coveted kiss.

But we who have no sentiment in our hearts and look only to the material worth of things, can find in the rye plant those elements of plant food that quickly and cheaply build up our soils to the highest and best fertility.

We so little appreciate the good things that God has provided for our welfare, and rye is one of the least appreciated crops on the farm. Aside from its great feeding value, it is one of the best soil builders, and is always so available and so willing to respond and give its best service to us under the varied conditions of soil, weather and seasons.

A BUNCH OF VETCH TAKEN FROM UNDER ICE AND WATER.

This vetch was covered with ice and water for three weeks in the month of January, yet the plants were bright and green and showed no injury. This vetch was taken from the field shown in the illustration of a field of vetch in full bloom.

CHAPTER IX

HUNGARIAN

HUNGARIAN is another one of the most valuable and less appreciated crops of the farm. For feeding purposes, for both cattle and horses, I rank it above clover or timothy hay. It is said to injure horses. A greater fallacy never existed. Cut just when the seed has formed, no injury results from feeding in any quantity. I have fed it for years to the best of horses, and they relished it and thrived upon it. It is the quickest and cheapest hay crop grown. It can be sown in July after a wheat, oats or pea crop has been removed, and in eight weeks or less a crop of hay can be gathered making from two to four tons to the acre, and after the removal of a crop of hungarian the land can be seeded to rye or wheat.

I have heard it said that it is a soil robber. I have not found it so.

A ton of hungarian extracts from the soil but eight pounds of nitrogen and eight pounds of potash more than a ton of green clover extracts from the soil.

For loosening up the soil nothing equals it.

In the summer of 1909 I had a field in corn, one-half of which the previous season had been in hungarian for hay, and there was no difference in the yield of corn,

but that part of the field previously in hungarian was more easily cultivated.

Farmers will condemn hungarian without foundation, and say that it is a robber of the soil, and yet raise year after year timothy, which I say and can prove is the meanest soil robber on the American farm. Mean, because I know of no more certain way to hasten the total exhaustion of the soil than to grow timothy year after year. On my farm I shun it as I would a rattlesnake. It takes six years of the best of treatment to rebuild soil upon which timothy has been grown for three or four years.

I know of fields, once rich, almost utterly made unfit for the growing of crops by the growing of timothy on them for a great number of years.

If I was forced to buy hay, I would rather pay $20 per ton for timothy hay than grow it on my farm. But I have digressed, I was to say something of the value of hungarian as a producer of organic matter.

It is said that a ton of hungarian in blossom contains twenty pounds of nitrogen, five and one-half pounds of phosphoric acid and seventeen pounds of potash.

It takes from one to one and one-half bushels of seed to sow an acre, worth generally from $1.50 per bushel, or $1.50 to $2.25 per acre. If but three tons of hungarian to the acre is grown and same is plowed under, you get 60 pounds of nitrogen to the acre. It will take six tons of barnyard manure to produce 60 pounds of nitrogen, and six tons of manure is worth not less than $1.50 per ton, or $9.

In addition to the large amount of nitrogen and potash

in a ton of hungarian, think of the vast quantities of organic matter to plow under and available as humus, and for loosening up the soil and for soil ventilation.

If hungarian is used as a plowing-under crop, I would advise sowing it after the wheat or oats crop is gathered, discing or plowing the ground deep, then when hungarian is in blossom and before the seed has matured, plow under five or six inches deep and sow to rye. You then have the advantage of from two or three plowings of the soil during a season, which I have shown to be a manuring in itself, as "tillage is a manure." Your soil is also covered during the leaching season, and has in the spring another valuable crop for plowing under.

By a little hustling a crop of hungarian could be sown after wheat, plowed under in time to sow wheat in the fall and which would be of immense value to the wheat crop.

A FIELD OF VETCH IN FULL BLOOM.

This field was pastured with cattle from early spring until about two weeks before this picture was taken.

CHAPTER X

SAND, OR HAIRY VETCH

IN 1906 the author purchased a farm that had the reputation of being one of the poorest in the county. It had been kicked and buffeted about as trading stock. Each owner no sooner got into possession of it when he found he had purchased a "gold brick," and never rested until he succeeded in unloading it upon some other victim. It never seemed to occur to any of its owners that the farm had simply been handled by soil robbers and was paying the penalty by withdrawing its bounty.

The author purchased this farm because of its cheapness, location and possibilities, and was given the laugh for so doing.

The character of the soil and lay of the land is peculiar. One-third consists of deep yellow sand, placed in ridges, no portion of any extent being level. One-third is level, sandy loam and the other third black Wabash bottom land.

The entire farm in its early history was covered with large walnut, poplar, oak and other timber, the timber on the sandy land having been as heavy as on the other portion of the farm. The land was a portion of an Indian reserve, set apart by the government to the In-

dians in 1818 and by the Indians sold in 1833, and was cleared more than sixty years ago, and for many years produced large crops. It had always been farmed upon the principle of getting out of it all you can each year and putting nothing back into the soil. Under this system of farming the sandy or two-thirds portion of the farm had become so poor that in the best season it produced but 15 to 20 bushels of corn, 5 to 10 bushels of oats and 10 bushels of wheat to the acre. Some seasons corn, oats and wheat were an entire failure. Even the black bottom portion was farmed in corn year after year until the yield fell to less than 40 bushels to the acre. In fine, the farm was just on the borderland of the abandoned farm.

As the author has been up against many of the hard propositions of life, it did not take him long to learn that in acquiring this farm he had tackled more than he had anticipated. He was like the Indian who was being worsted in a hand-to-hand conflict and who exclaimed, "Me in a heap big fight."

To reclaim this land, the author soon realized, would require some work and study.

The first season he planted the sandy portion to early peas for canning purposes. Seven weeks of dry weather reduced the crop to a money value of $10 per acre. Upon the removal of the peas the land was disced and planted in sweet corn before June 25. The sweet corn brought a money value of $15 per acre.

Various crops were grown on the farm the first season, to-wit: Peas, sugar corn, canning beets, field corn, tomatoes and potatoes. Some commercial fertilizer and

manure was used; the commercial fertilizer with little or no success.

Had it not been for twenty acres of late peas sown on the bottom lands that brought a money value of $75 per acre, the farm the first year would not have paid expenses.

But the author was not discouraged. He was constantly studying conditions and looking about for something and some method by which the soil of his farm could be rebuilt.

One day during the first summer he received through the mail a catalogue of a seed house, and in turning its pages his eyes caught the words "Sandy Vetch." The fact that he owned some sand that was then the uppermost subject in his mind no doubt had something to do with arresting his eyes upon the words.

Reading the description in the catalogue of this plant, which said that "Sand Vetch was becoming more popular with the farmers of the country as they learned more of its value; that it was noted for its extreme hardiness, its value as a cover crop and for forage and fertilizing purposes; that it was especially recommended for poor soils where it thrives wonderfully and improves the soil, being rich in nitrogen," the author began to "sit up and take notice."

It did not take him long to learn that he was interested and intensely interested. But when he read further that "the Washington Department of Agriculture estimated the value of an acre of vetch plowed under as equivalent to putting into the ground twenty or forty dollars' worth of commercial fertilizer," he became en-

thusiastic. He was ready to shout at the top of his voice "Eureka!" But he read on until he came to where the description said: "It is suited to any soil, and is valuable in this respect, as it produces good crops on poor sandy soils, while on good land it grows to a height of four or five feet and produces enormous crops."

This was enough. He was convinced that he had been rewarded in his search, and had indeed found the precious alchemic soil-enriching art for which he had been searching, and immediately sat down with "pen in hand" and ordered seed enough to sow two acres. Yes, two whole acres!

And now, in the light of six years' experience with this valuable plant, the author smiles when he thinks that, being up against one of the hardest propositions of his life, and having placed in his hands the very thing that would overcome it, he only had nerve enough to order enough vetch seed to plant two acres, for had he possessed the nerve to have ordered enough to plant his entire farm, and then the following spring planted the same in field corn, as subsequent experience demonstrated, he would have received from the corn crop almost the purchase price of the farm.

In due time the seed was received, and in August it was planted upon the poorest and most rolling two acres of sand land on the farm. It grew rapidly, and by winter the ground was so completely covered with its foliage that washing of the land was entirely prevented. An examination of the roots showed them set thick with nitrogen nodules. Early in the spring, before any other

kinds of grass or vegetation began to grow, the vetch plants were pushing out their summer foliage, and by May 1 they were four feet in length. About the first of June the two acres were cut for hay.

The author saw clearly that he had found a valuable plant for the farm, yet exemplified usual caution by planting only 25 acres of vetch in August of 1907, the sowing being on the poorest and sandiest land of the farm, 21 acres in one field and four in another. It was decided to seed the 21 acres to field corn and leave the other for pasture. Both grew luxuriantly.

The spring of 1908 was very wet, and it was May 1 before the ground was in condition to break for corn. Delays were such that the 21-acre field was not entirely broken until May 25. The vetch had grown to a height of five feet, and the mass of vegetation was so heavy that it was almost impossible to turn under. A half dozen makes of plows were tried with complete failure, when finally success was obtained with a double disc plow, and the field was finished. The prospect did not look inviting, for bunches of vetch showed here and there sticking out of the ground. The field was worked down to fairly good condition for planting by dragging and rolling, and on June 3 and 4 was planted to yellow corn.

Dire were the predictions made as to the outcome. Many contended that the heavy mass of vegetation would absorb all the moisture from the ground and the corn would perish. And it cannot be said that the author was fairly hopeful. But he gritted his teeth, held his counsel and awaited results. The corn came up a

splendid stand. Dry weather set in, which added no little discomfort to the situation. The corn grew slowly, and as soon as it was sufficiently large the cultivators were set to work, and were worked with a little difficulty on account of bunches of vetch insufficiently plowed under catching on the cultivator points.

It was amusing to hear the side remarks of the men working the cultivators, which would indirectly come to the author's ears.

One day, when the corn was receiving its first plowing, two hardware men from the city came out to set up and start working a new two-row cultivator. When they were taken to this field disgust was plainly shown upon their countenances. One of them, after the corn grown in this field had been harvested, told the author that when he first looked upon the field he said to himself that in all his forty years' experience as a farmer and seller of agricultural tools he had never seen so unpromising a prospect for corn as this field presented.

As stated, the weather was dry, and the corn grew five or six inches high, and made no further growth for more than a week, when it seemed to take on new life, and then how it did grow! My, the pride the author did take in that field of growing corn! How it sparkled his eyes and swelled his pride to look upon it! He felt the glory of having done something worth while. The neighbors and travelers along the highway began to take notice as the corn grew and grew like Jack's famous bean stalk.

The corn, notwithstanding the rolling and hilly character of the field, was of the same height, every hill

VETCH STEMS SHOWING BLOOM AND SEED PODS.

alike, and of the dark green color indicating the healthy growth of corn.

When the corn reached waist height the prophets who had predicted its untimely demise on account of the great mass of vetch turned under said: "Wait until it begins to ear, and then you will see it fire and wither up."

But the corn grew up and up until it reached the height of eight to ten feet, silked, tasseled, and bore its ears of golden corn.

It was subject to six weeks of dry weather after it had silked, and yet it had not fired and every hill was bright and green. The neighbor's corn opposite and across the public highway fired clear above the ears of corn, and did not make 20 bushels to the acre.

Residents of the county not acquainted with what had been done to the field, who had been passing this field for twenty years or more, attracted by the remarkable growth and condition of the corn, would stop, get out of their vehicles and go over into the field to examine it, and then stop at the house and inquire what had been done to the soil to cause such a growth of corn, saying that "they had never known this field to have upon it a crop of corn of any value; that corn on this field was almost invariably a failure."

The corn finally reached its harvesting stage, sound and solid. It was gathered, hauled to market, and made by weight 72 bushels to the acre, and brought a money value of $35 per acre.

The planter used to plant the corn was set to drop three grains to the hill, and never missed putting three

grains in the hill, but too often dropped four grains, which made the corn too thick, and this condition fully reduced the yield ten or more bushels to the acre. But think of 72 bushels of corn being grown on land that had not for twenty or more years produced more than 20 bushels to the acre, and this feat accomplished in so short a time and with so little expense, as the cost of the seed was but $3.50 per acre.

This experiment with vetch made the author a vetch enthusiast.

In August of the year 1908 he planted thirty acres, and notwithstanding the extreme dry fall, there having been no rain for eight weeks after it was sown, it grew nicely.

In the spring ten acres of it was plowed for field corn, seven or eight acres for potatoes, and the balance for sweet corn.

The illustration in the front of this book shows a view of the poorest part of the field of corn taken September 7, 1909.

Upon this particular spot of ground shown in the picture corn had never grown to exceed a height of four or five feet, with a correspondingly poor yield. Here the vetch was the heaviest, being four or five feet in height when plowed under in the middle of May. The soil on this particular spot is a sandy clay, the remainder of the field is a black gumbo soil; the whole having been farmed for a half century with a rotation of corn, oats and wheat, a greater majority of the years in corn, and every year the stalks were burned. In recent years the yield of corn had been from almost a failure to 40 bush-

els to the acre. The yield after the vetch was nearly 90 bushels to the acre of large, splendid white corn — an increase over former years of over 100 per cent. The cost of vetch seed for this field was $3 per acre.

The author's brother is the owner of a farm the soil of which is clay underlaid with a gravelly subsoil. When first cleared, more than sixty years ago, it was rich and produced enormous crops. Fifty years in the hands of tenants, with an insufficient soil-building material added to it, reduced the yield of corn to less than 30 bushels to the acre. In the fall of 1908 fifty acres of this land was planted to vetch. The extreme dry fall made the seed come up slow and uneven, and only a fair growth was obtained before winter. At plowing time the following spring a fair crop of vetch was plowed under and forty acres planted to field corn. The crop gathered from the field corn produced over 70 bushels of corn to the acre — an increase of over 100 per cent.

Ten acres were plowed under and the ground cultivated until June, when it was planted to alfalfa, about which we will speak later. Another vetch enthusiast was added to the list.

Both author and brother had (December 20th, 1909) vetch growing on their farms, sowed in the open and in corn, that covers the ground like a thick velvet carpet.

The author's experience with vetch for potatoes and sweet corn has been as successful as it has been with field corn. Sweet corn has been grown after vetch on poor soil that produced from 4½ to 5 tons to the acre — a money value of $36 to $40 per acre. In 1909 one

and two-fifths acres of potatoes planted after vetch on soil deficient in fertility produced nearly 450 bushels, and potatoes planted after vetch on some of the sandiest land on his farm produced at the rate of 150 bushels to the acre, and double the amount of potatoes grown side by side on the same soil after crimson clover plowed under.

No doubt the question suggested to the reader's mind is: Why is vetch of so much value as a soil or fertilizer crop? The question may be answered with a few words. It is the greatest nitrogen-gathering and humus-producing plant found in Nature's garden.

We believe it to be true as holy writ that for every disease of the human body Nature has a remedy if man can only find it, and that for every disease of the soil there is a remedy to be found in the plant, mineral or animal kingdom, and it is up to man to find and apply it.

If soil was originally built up by mixing vegetable matter with disintegrated minerals and stones, then why can it not be kept built up by the same process?

Under Southern European skies vetch is supposed to have had its birth. In all Europe it is cultivated for forage purposes, it being regarded equal to clover in nutritive qualities. Sown in late summer or early autumn, it is harvested the next year. If in the spring, it is cut the same year.

The American farmer, slow or overly cautious in trying the unknown, has rarely cultivated it. As stated, it is an annual plant, and must be seeded each year, although it readily reseeds itself, as I have pastured it

with cattle, taking the cattle from it as it began to seed, and then allowed the seed to ripen and fall upon the ground, discing the field thoroughly, and the seed came up, giving me a fine stand.

Vetch being rarely cultivated in America, the supply of seed is, as a consequence, procured in Europe and imported to this country at a cost to the farmer of 6½ to 10 cents per pound f. o. b. shipping station.

Fifty pounds of seed to the acre is the right quantity to plant.

In corn I sow the seed with a one-horse hoe or disc wheat drill. In the open I sow with a two-horse drill. The feed gauge of the average one or two-horse drill entirely shut off sows just 50 pounds to the acre.

If vetch is sown for seed, there must be sowed with it about one peck of rye to the acre. The rye holds up the vetch so it can be easily harvested. The plant is a trailing one, and hence is hard to harvest unless it has a plant sown with it to support it.

When seed is ripe, cut and thresh with ordinary threshing machine and separate seed with fanning mill.

Seed for planting can be procured from most any seed house.

The vetch plant has a mass of roots penetrating the soil to a considerable depth. The roots are always full of nodules, the homes of the bacteria that obtain their food from the nitrogen of the air, and which it is claimed collect more nitrogen than they need, which surplus is stored into the soil.

The clover, alfalfa and pea plants and other plants of the legume family are considered valuable to the soil

because of their nitrogen-gathering powers, they having these nodules on their roots; but a vetch plant will have ten nodules on its roots where these other plants have one.

The vetch roots are so numerous in the soil that it will plow up like heavy sod. The foliage of the plant is so massive that it produces from twelve to twenty tons to the acre. There is no plant of the nitrogen-gathering species that produces such a quantity of organic matter for plowing under as is furnished by the vetch plant.

When plowing up the 21-acre field mentioned in the beginning of this chapter the next spring after the large corn crop had been grown, the author observed that the corn roots had pushed their way down into the mass of vetch plowed under, and had interlaced themselves around the vetch stems until the whole mass had been knitted together, and, the plow turning it on top of the furrow, it looked like sheep skins spread out on the ground. On exposure to the air the mass fell into small pieces.

This observation proved to the author that the corn roots had found in this mass of vegetable matter a great feeding ground, where both feed and moisture were found in abundance for the feeding of the corn plants.

After six years' experience with it I am convinced that the claim of the Agricultural Department, that an acre of it plowed under is equivalent in value to twenty to forty dollars, is not extravagant.

It is the greatest soil builder ever discovered, alfalfa not excepted. With it and ditching I can reclaim any

poor or worn-out soil. With it the American farmer can make his soil produce as it has never produced since it was rescued from the wilderness.

Vetch is the remedy for clover-sick soil. If alfalfa is the most valuable forage plant ever discovered, vetch is the most valuable fertilizing plant ever discovered.

Vetch builds on its roots so many pretty little homes for the busy nitrogen-gatherers, who so mysteriously draw from the great storehouse of nitrogen situated in the air above the soil great quantities of the precious, most valuable acquisition to the soil, nitrogen.

Vetch is no respecter of soils. It settles down and makes its home with the rich or poor clay as well as the rich or poor sand, and commences its business of soil restoration at once. It has no terrors of frost or drought. Winter will grasp it with its hand and hold it in its icy clasp for months and months, and when the warm sunshine of spring releases it, it smiles with its freshness of green and continues doing business at the old stand. The drought of fall, spring or summer will blow its oven breath upon it, but it heeds it not, and continues its business of storing fertility in the soil as though it was being constantly caressed with refreshing showers.

It finds the soil sick, impoverished and dying. It touches it with its restoring power, and under its stimulating touch the soil awakens with new and renewed life, pouring out its wealth of plant growth that ripens into food for beast and man.

It will yet enter upon the abandoned farm, banish the desolation of the fields, fill the unoccupied farmhouse

and barns with the songs of happy, prosperous parents, the laughter of children and the riches of fertile fields.

All hail King Vetch, Nature's greatest soil restorer!

VETCH PLANTS TAKEN IN JANUARY FROM TOP OF HIGH SAND RIDGE

These plants were exposed to a temperature of 17 degrees below zero. On account of their situation they had no snow covering as the winter winds kept the sand ridge bare of snow, yet they showed no effects of the weather they endured.

CHAPTER XI

ALFALFA

THE value of alfalfa on the farm cannot be estimated. No plant has so many uses. If the corn plant should become extinct, alfalfa could take its place, fill every want that corn supplies, and yet its storehouse of utility would still be overstocked.

Considering the great usefulness of this plant, it is astonishing that the American farmer grows so little of it. It cannot be on account of ignorance, for volumes have been written about it by the great alfalfa experts, Coburn, Clothier and Wing, the public press and agricultural papers, and for years lectures upon its value have been given to Farmers' Institutes all over the country.

The slowness of the farmer in growing alfalfa is no doubt due to environment, or his habit of farming "just as father did." In many instances it is due to downright laziness, or that spirit of lethargy or state of indifference that has gotten its hold on so many farmers, and which is responsible for our worn-out soils.

The average farmer does not seem to be in the possession of the spirit possessed by the modern manufacturer who does not hesitate to adopt any improvement or buy any improved machinery that will increase the efficiency of his plant.

There is no plant on the farm that is so profitable to the farmer as alfalfa. When the Kansas farmer commenced to grow it he began to wax fat. His bank account grew, his mortgage was canceled, his house and barn grew into stately buildings filled with those equipments and machinery that lessen toil, and make life worth while.

If this plant has done so much for the Kansas farmer, why can it not do as much for the farmers of every state in the Union?

Alfalfa on the farm in most any state means at least three crops of hay each season whose feeding power has no equal.

It means plenty of pasture for all stock no matter how dry the season may be.

It means a food in abundance for the hog, greater in fattening and health preserving powers than any food ever grown and fed to this animal.

It means better milk, butter, beaf, mutton and poultry.

It means that this busy plant, which never rests, will send its great long nodule-producing roots down deep into the soil, opening the way for the water and air, producing organic matter, liberating and bringing up the valuable plant minerals, drawing from the air into the soil the precious nitrogen, and thus rebuilding and making rich again the soils wasted of their fertility by the sordid system of farming so long practiced in this land of ours.

Some farmers say that the reason they do not grow alfalfa is because it is hard to get it started; that it requires so much labor and patience to get the proper

stand and start that they can not afford to bother with it.

The author has found that it is easier to get a stand of and grow alfalfa than it is to get a stand of and grow clover. He has also found that the first requisite to successful alfalfa growing is a well drained soil. Alfalfa can not grow with "wet feet."

In the growing of alfalfa the author has pursued the following methods with great success:

When he decided upon the location of his alfalfa field (and in selecting the field he paid no attention to character of soil, but selected the field with reference to easy access to barn and stock), he plowed the land deep in the spring and planted to either field or sugar corn. After the corn was laid by he sowed the field to sand or hairy vetch at the rate of thirty-five pounds to the acre, and thereafter kept all stock off of same. The following season the vetch is allowed to grow until it has bloomed, then the vetch and corn stalks are plowed under as deeply as possible and the soil thoroughly rolled and dragged. This plowing is generally done in July, and the field is not only rolled and dragged several times, but is harrowed quite a number of times until the soil is in an excellent state of pulverization.

If manure is available a thin coating is spread with a manure spreader, the spreading being done after plowing and the manure being worked into the soil with the harrow. The spreading of a thin coating of manure upon alfalfa ground after it is plowed will insure a stand of alfalfa. And the plowing under of vetch without manure will also insure a stand of alfalfa.

The seed at the rate of twenty pounds to the acre is sown either with a hand seeder or a seeder attached to the front part of a disc drill. The seed must be well covered or it will not grow. The author wishes to impress upon the reader the importance of getting the seed deep enough into the ground, or well covered, as he has noticed that where the seed was covered the best that the stand of alfalfa was the best. The author is firmly of the belief that the majority of failures in securing a stand of either clover or alfalfa are occasioned by failure in getting seed covered a sufficient depth.

The best time to sow alfalfa seed is from the first to the middle of August. The plant will reach a height of seven or eight inches in six weeks. At this stage many claim it should be clipped with a mower. The author has practiced the clipping of baby alfalfa and has also allowed it to grow without clipping and was unable to see any difference in either method; but after the first season alfalfa must be mowed at the proper stage, which is when new shoots begin to push out from the plant near the ground, or it loses its vigor.

Authorities on alfalfa tell us that the alfalfa plant when first started must get its nitrogen, which is necessary to its life, from the soil; that after the plant is well established it draws its supply of nitrogen from the air; that for this reason you must have your soil inoculated with nitrogen-gathering bacteria, and have plenty of nitrogen in the soil or you cannot get the alfalfa plant to establish itself. Then, if this is true, some method must be used to secure the supply of nitrogen and nitrogen-gathering bacteria in the soil intended for the alfalfa

field. Various methods of doing this are given by alfalfa experts, such as soil inoculation by taking soil from alfalfa fields and spreading upon the field before sowing the seed, heavy manuring, sowing alfalfa meal with the seed, and feeding alfalfa hay to stock a year before alfalfa is planted and using the manure on the field.

The author has never been impressed with the inoculating method of securing soil from an alfalfa field and spreading upon the field intended to be sown. Upon that proposition he is "from Missouri and will have to be shown," but he has been shown that manure will inoculate for alfalfa. He has spread manure and sown alfalfa seed upon a dead furrow where the soil was so poor that no plant would grow upon it and secured a stand that for vigor of growth exceeded that grown upon good ground.

His experience has also taught him that where you can not procure manure, vetch will inoculate the soil and make alfalfa grow vigorously.

The author in his chapter on vetch spoke of ten acres of alfalfa planted in June, 1909, upon clay land owned by his brother. This field has been cleared for more than sixty years and has been farmed until it was worn-out. As stated, it was planted to vetch in August, 1908, and plowed under in May, 1909, before it had ripened its seed. The weeds were kept down by frequent cultivation until the middle of June, when alfalfa seed was sown at the rate of twenty pounds to the acre. In four weeks the alfalfa was six or eight inches in height, and was clipped with the mower, clippings left lying on the

ground. In five weeks it was clipped the second time. In the summer of 1910 and 1911 this field yielded several cuttings of hay and yet was pastured by a large number of hogs.

If the season is favorable as to plenty of moisture alfalfa can be sown in April, provided it is sown with barley at the rate of one bushel of barley to the acre. Cut the barley when it is in the milk and cure it for feed. It makes fine feed. If the season is dry the barley will use up so much moisture that the young alfalfa plants will die.

In the spring of 1911, which was very dry, the author planted a field to alfalfa and barley and both plants came up fine, but it was so dry that the barley took all the moisture and the young alfalfa plants all died but a few, a stand was only secured on one acre of the field, and that portion of the field was low ground and in it a great deal of organic matter had been plowed under which held the moisture.

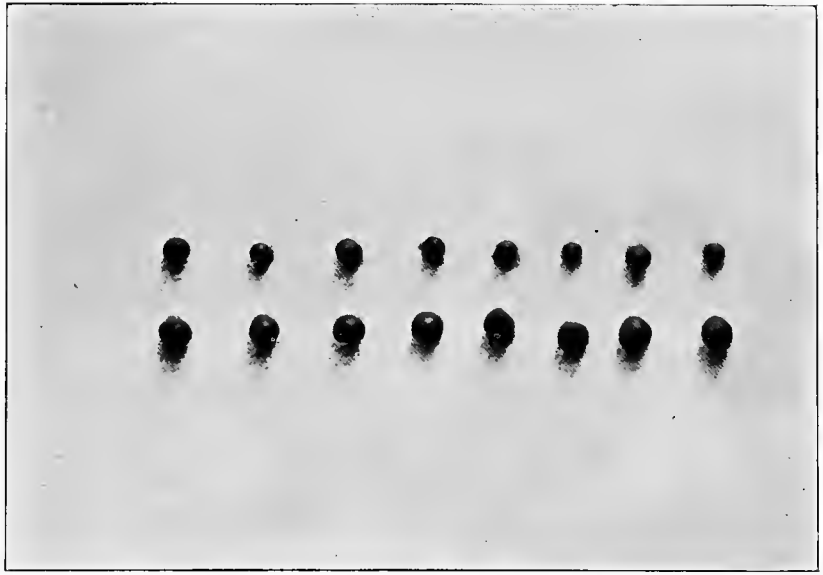
Good stands of alfalfa have been secured by sowing in sweet corn after the corn was gathered in the latter part of August, but the seed was well covered, and the season was favorable in the way of moisture.

The use of ground limestone is a great aid in securing a vigorous growth of alfalfa, but in the majority of farms it is not necessary to use it.

Alfalfa will so build up and restore worn-out soils that large crops of corn can be grown upon them, and will so maintain the fertility of average soils that they will not become worn.

The author's personal experience with this plant and

his observation of what it has done for other land than his own, leads him to urge the growing of this plant by every farmer. It is one of the plants that should be found on every farm for it never fails the farmer, no matter what the season may be.



VETCH SEED, ACTUAL SIZE.

Top row, Hairy Vetch. Bottom row, Spring Vetch. The Hairy Vetch seeds are round, hard and of a bluish-black color and size of No. 2 and No. 3 shot. The Spring Vetch seeds are a third larger than the Winter Vetch; in color are gray mottled, and are not round but somewhat flattened.

CHAPTER XII

SWEET CLOVER

A FEW years ago a plant sprung up along our roadsides in great profusion. It grew so vigorously and spread so rapidly that farmers became alarmed and feared it would become a troublesome weed.

Strange as it may seem, this plant seldom invaded the cultivated fields or rich spots of the farms. It was found only where the soil was the thinnest and poorest.

It was soon discovered that this plant supposed to be a noxious weed, was designed to be a renovator of exhausted soils. That it languished and died on a fairly rich soil, but grew luxuriantly on soils so poor that nothing else scarcely would grow on them.

Thus the sweet clover plant despised and rejected at first, at last became a chief corner stone in soil restoration.

When planted on the poorest of clay soils where nothing grew, it soon made them so fertile that other grasses came and smothered out the clover. It has been known to so enrich bottom land whose top soil had been washed away by high waters that 60 to 75 bushels of corn was again grown on it. It has reclaimed poor, much-washed hillsides.

Years ago the wreckage of a Dutch ship was cast

upon the raw, white beach sand of King Island, located near the south coast of Australia. Among the wreckage were some mattresses that had been stuffed with sweet clover which contained some seed. This seed fell upon the sandy beaches and grew, and in the course of time spread over the whole of the coast of this island and transformed it from an island of useless shifting sand to a land rich in grazing for cattle, sheep and horses. This wonderful plant by its almost magical enriching powers has made of the white sand a dark brown soil and increased its value a hundredfold. A once barren island of sand now exports fat cattle and dairy produce and fine horses of the finest grades and quality that command the highest prices in the markets of Tasmania.

The powers of the plant as a soil builder is simply its ability to gather from the air and store into the soil great quantities of nitrogen, and produce through its root and branch system great quantities of organic matter estimated as high as twenty tons to the acre.

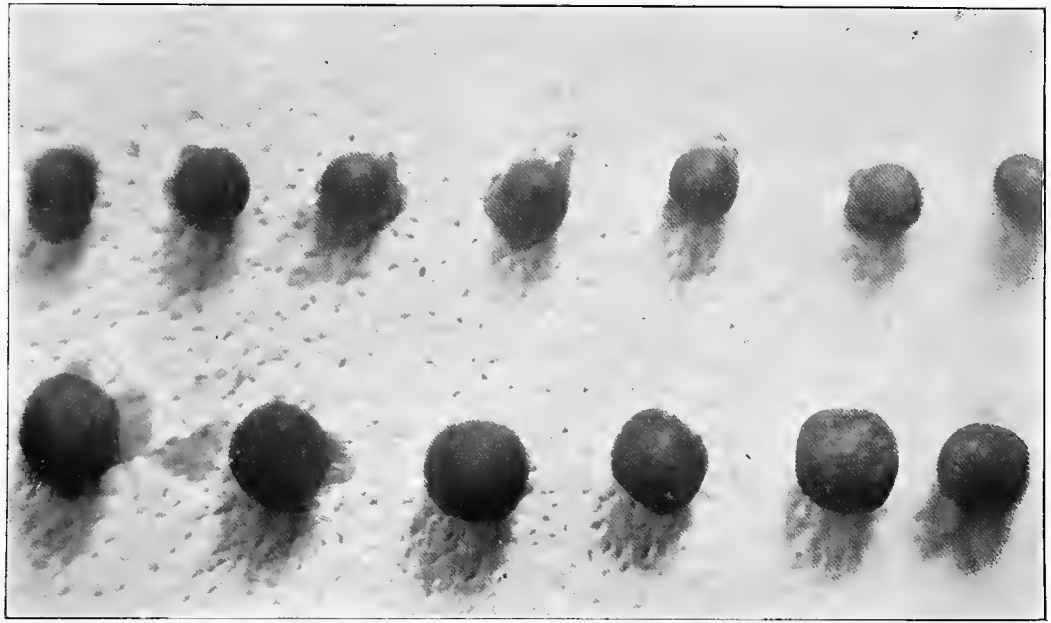
It is simply a great nitrogen-gathering and organic matter producing plant, and herein alone lies its secret as a soil builder. And while the author has never experimented with this plant, he is satisfied that its merits have not been exaggerated, because any plant that has the capacity to draw from the air large quantities of nitrogen and which produces a large quantity of organic matter in its foliage and root system, and which will so readily grow on poor soil, is a plant whose worth as a soil builder cannot be estimated.

Any one possessing lands so poor that nothing will grow on them should not hesitate to give sweet clover a

trial. Do not worry about the plant becoming a noxious weed on the farm. It will only grow on the poor lands and these lands need it.

In the building up of our worn soils and in keeping up the fertility of our fairly rich soils, we must bring to our use those plants that will gather the nitrogen and furnish the most organic matter and the best soil-covering material, and sweet clover seems to be one of this kind of plants.

The author has written the chapter on sweet clover for this edition of his book to make more emphatic to his readers the fact, that, the chief lack of worn-out soils is nitrogen and organic matter, and that whenever we make use of those plants, upon our worn-out soils that gather nitrogen from the air and produce great quantities of organic matter, that we are then getting on the only road that leads us to soil restoration.



HAIRY AND SPRING VETCH SEED, MAGNIFIED SEVERAL TIMES.
Top row, Hairy Vetch. Bottom row, Spring Vetch.

CHAPTER XIII

RED CLOVER

WHEN the first edition of this book was published, the author was frequently asked why he had not written a chapter on red clover, recommending its use for restoring worn and worn-out soils.

The author's answer was, "Red clover was evidently intended to be used for the maintaining of the fertility of fertile soils, for it will not grow and flourish on worn and worn-out soils, and, as my book treats of the worn soil problem, I could not prescribe clover as a remedy to restore worn-out soils."

Yet, if we should ask the farmer to name the best fertilizing and feeding plant, probably nine hundred and ninety-nine out of every thousand would promptly answer, red clover. The farmer so answers because he and his ancestors have for centuries made use of this plant for fertilizing and feeding purposes, and if any one questions its virtues and suggests that there are many other plants of greater fertilizing and feeding power, he is denounced as a deceiver, and the plants named for a substitute are denominated false pretenders and cheap imitators, notwithstanding the fact that there is no plant grown upon the farm that has to its credit so many bad points as clover.

The young plant is tender and feeble, so millions of dollars are lost every year in the purchase of clover seed that starts to grow only to die from the effects of drouth or atmospheric changes. Its hay, though rich in feeding value, gives off a dust distressing and injurious to animals. It cannot be pastured without producing its death-dealing bloat.

It robs the soil of its phosphorus and cannot be grown continuously on the same land without producing the "clover sick" soils upon which it refuses to continue to grow, and it spurns the attempt to make it establish its home in sandy, compact clay, prairie gumbo or worn-out soils, where it is needed the most.

The author concedes that clover is valuable for maintaining the fertility of soils that are not worn, if used in the right manner.

While clover grown for hay and seed alone may draw nitrogen into the soil and make the soil loose and friable, and thus improve soil ventilation, yet it must take valuable elements from the soil or it would not, after a time, refuse to grow on land where it had made its home for several years.

If it had all the virtues claimed for it, why is it that in the regions where longest and mostly used we have the greatest number of acres of worn and worn-out soils?

The author points the reader to the great Volusia region with its acres of "clover sick" and abandoned soils, where 100 acres in 1907 produced two small stacks of clover hay, and where lands that sold in 1803 for $37 per acre, in 1907 sold for $5 per acre. Lands that

were abandoned because they would no longer grow clover and the owners did not seem to know that there were other plants and methods that would restore their lands. Let the author quote what was said by a Government expert about one of these Volusia farms.

"In 1883 this farm produced clover hay at the rate of 2½ tons per acre for the first cutting, and clover seed from the second growth at the rate of four bushels per acre; nearly $700 worth of grain was produced and sold, and three cows, twenty sheep, and a team kept. The total yield of all crops for each of the past five seasons grown on this farm would not support more than twenty sheep and nothing was sold. *No clover is grown, and it cannot be grown by the methods now in practice.*"

He further said of these Volusia farms, that when they were first cleared they brought forth large crop yields of all the staple grains. *That there was no difficulty in growing red clover,* and that the region was well populated and the farms were prosperous.

Another expert says of these soils, "that the failure of clover to grow on them is not due to any fungous disease of the clover plant, nor to the lack of the proper kind of bacteria in the soil, or to other influences of such a character, and that a chemical analysis of the soil by standard methods shows a sufficient amount of the common plant-food elements for successful crop growth."

Upon these soils where clover refuses to grow, other crops refuse to grow as well, and farms are being abandoned, buildings are going to decay and ruin.

Some of these same conditions to a considerable extent abound in every region where clover is grown. Then

if clover is such a great plant for maintaining soil fertility as so many would have us believe it is, why do we have the conditions enumerated? Almost every farmer grows or attempts to grow it, and with the vast quantities that has been so long grown, our farms should show a high state of fertility if there be the fertilizing virtues in the plant claimed by its advocates.

It is said that "Land becomes 'clover sick' only in the absence of a proper succession of crops, and the elements of fertility necessary for the support of the plant."

There is some element in the soil necessary to the vigorous growth of clover that is soon exhausted or our soils would not refuse to grow the plant, which shows the necessity of the proper handling of this plant with profit.

Its success in soil building is only attained when its entire crop is left upon the soil or plowed under, for then it returns back again to the soil every element it extracts from it, and gives to the soil the element it extracts from the atmosphere, the organic matter it produces and the advantage of its covering.

The author wishes to be understood as advocating the use of clover when it can be grown, but he does not hesitate to say that it is not a success as a first aid to the restoration of worn-out soils. If it could be made to grow on worn-out soils, and was not cut for either hay or seed, but its entire crop plowed under at the proper time, it would then be a valuable aid in building up our worn-out soils. And it must be used in the same manner or with a proper crop rotation if cut for hay or

seed, upon our fertile farms, if we would save them from the doom of "clover sick" soils.

To get the best growth of clover we must have vegetable or organic matter in the soil. The author is of the opinion that herein lies the secret of the cause of "clover sick" soils, they lack the necessary organic matter to produce the necessary soil ventilation and food to prepare a suitable home for the soil bacteria that clover must have for its successful growth.

The author has been watching a series of experiments being conducted on some worn-out clay lands that were "clover sick." Years ago all the organic matter had been farmed out of these lands. Organic matter was again put into these lands by the growing of rye, vetch, sorghum and the use of manure, and all plowed under as deep as possible with a disc plow, and planted to corn, and again planted to rye and vetch and the entire crop of cornstalks, rye and vetch plowed under again. After a few years of this method of getting organic matter into this soil it was in such condition that fine crops of clover have been produced upon them. And that part of these lands upon which no manure was put, but only crops of rye, vetch, sorghum and cornstalks were plowed under, grew clover as well as the manured parts.

The successful growing and judicious use of clover on the farm only makes it a valuable fertilizing crop to the farmer. A judicious use of clover means that if the farmer thinks he must grow it for hay or seed, then he must follow it with other crops that will either produce organic matter or allow the use of other organic matter

producing plants, so that a supply of organic matter may be secured for his soil.

The most powerful way to use clover is to allow one clover crop to grow and die and then plow it under dry the following spring.

In this manner you would get the additional great benefits of soil covering. Another effective method is to allow it to come into full bloom then cut it, leaving it lying on the ground for the second crop to come up through it, then cut the second crop so that it will have some time to decay before plowing it in for wheat. Either of these two methods of handling the clover crop will so enrich the soil that the effects will linger for years.

An illustration is given of a Pennsylvania farmer who, after great effort, succeeded in getting a stand of clover upon the light colored soil of one of his poor worn-out fields and then turned the field back to Nature as it were, kept all his stock out of it, and allowed the clover to grow and reseed itself for several years. When the field was finally plowed it was found that the soil had become black for the depth of nearly a foot, and was so enriched that it produced large crops for many years afterwards. And herein is a valuable lesson for the American farmer if he will but learn it. The lesson, that man must follow Nature's way of soil building if he would restore or keep up the fertility of the soil.

A PROMISING CORN FIELD ON WORN-OUT SOIL FERTILIZED BY PLOWING UNDER VETCH.

Before vetch was planted on this soil, corn grew only four and five feet high. Picture taken September 11, 1909.

CHAPTER XIV

THE AUTHOR'S METHOD OF RESTORING WORN AND WORN-OUT SOILS

IT is said you cannot "eat your cake and yet have it." So some will say you cannot restore worn-out soils and at the same time grow profitable crops upon them. That worn-out soils can only be restored by expensive methods and years must elapse before any profitable crops can be grown upon them.

The author has demonstrated that you can "eat your cake and yet have it." That worn-out soils can be restored and yet at the very time you are engaged in the process of restoring them you can grow profitable crops upon them.

When he came into possession of his "Vetchfalfa Farm," it was, as heretofore stated, one of the poorest in the county. In the entire six years he has owned it, he has made it pay each year, after deducting all expenses and taxes, a profit of 6 per cent. per annum. He has increased its value from $75 per acre to $150 per acre, for he has been offered the latter sum for it.

So if the author had placed in his possession worn or worn-out soils he would proceed to restore them in the following manner:

If he lived in the vicinity of a canning factory that canned peas and sugar corn, he would first see that the

soil was thoroughly ditched; then would plow it as early in the spring as possible and plant to early peas. The crop ought to be ready to remove by June 15. They have been removed as early as June 10.

Immediately after the peas were harvested, he would have the ground thoroughly disced and planted to sugar corn. This crop should be well cultivated and kept clear of weeds.

If the soil was much worn it is probable you would only receive from the crop of peas and sugar corn enough money to pay expenses, but you would be well started on the road of soil restoration, and that start must be made.

Early in August he would plant in the sugar corn either vetch or rye. His preference would be vetch always.

Under no circumstances would he pasture the stalks of sweet corn, although they are of great value for this purpose, but you must remember that you are engaged in the business of soil building, so do not let greed get the upper hand. Leave the stalks alone for plowing under with the vetch.

In the spring of next season, about the 1st of May he would plow under the vetch and stalks, and about the 10th of May plant to field corn, giving same thorough cultivation, and when same was plowed the last time, would sow to rye or vetch. In this case he would as soon sow rye as vetch.

He would not allow the corn or rye to be pastured, and the following spring would plow the whole under and plant again to field corn. Both these crops of field

corn he knows would produce to your surprise and the surprise of your neighbors, and you would be well along on the highway of building up your soil.

After the second crop of field corn the soil could be planted to wheat, followed with clover.

If you do not live in the vicinity of a canning factory, then your first planting could be either cowpeas or hungarian, but these crops should be turned under before the ripening of their seed, and the soil sown to rye or vetch; the author's preference would be vetch.

The following spring plow up and plant to field corn, the same at laying-by time to be planted either to vetch or rye, and the next season to be plowed up and put in corn, to be followed with wheat and clover, the clover to be plowed under.

The author knows that this method of soil building will work grandly, for he has tried it.

With this method the author can in two seasons grow from 50 to 100 bushels of corn to the acre on most any worn-out soils.

On fairly good soils results will astonish you.

If you wish to start alfalfa on a piece of worn soil, and live near a canning factory, sow to peas as directed and follow with sweet corn and vetch; keep off stock and plow under vetch before ripening of the seed, and keep cultivating your ground until middle of July or first of August and sow to alfalfa. Clip the alfalfa when five or six inches high, leaving clippings on the ground, and clip again before winter if growth should be considerable, or allow it to grow the first season without clipping.

If you do not live near a canning factory, sow hungarian, and if ground is much worn, plow under before seed ripens and sow to vetch. But if soil is fairly rich, cut the hungarian for hay just as seed has formed, and then disc thoroughly and sow to vetch.

The following spring, in either of the above cases, plow under the vetch before it ripens its seed. Keep the ground cultivated until you are ready to sow the alfalfa seed, which may be any time from the middle of July to the first of August, the earlier the better. If you use care in selecting and sowing your alfalfa seed, you will obtain a splendid stand and crop of alfalfa.

In case you plow under your hungarian you lose a year's crop, but suppose you do; you gain more than you lose in the fertility you gain and the condition in which you get your soil.

If your soil is not poor and you cut your hungarian, you will get a vast quantity of fine hay, which, as stated, the author regards as the best hay that can be grown on the farm, alfalfa alone excepted.

Peas, hungarian and vetch planted in the manner stated blaze the way through the perplexities of compact, non-inoculated soils to successful alfalfa growing. There is no doubt about it; try it and see.

The author has elsewhere stated that it is a great mistake to allow soils to be idle. There is only one exception, and that is when you are starting a blue grass pasture.

The soil should ever be occupied in growing a crop intended either for grain, feeding or plowing under.

Field corn, after it is laid by, ought always to be sown

with vetch, rye or clover, even if same field is to be put in corn the next season.

If wheat ground is to be followed with corn, the same should be disced or broken immediately after wheat is removed and sown to vetch or rye, the same to be plowed under in the spring.

By following this plan you gain the advantage of tillage, soil covering, and getting organic matter in the soil.

The author's secret in restoring his "Vetchfalfa Farm" lies in the fact that he has each and every year produced and plowed under large crops of organic matter. He has never allowed any of his corn fields to be pastured and has always sown them to vetch or rye after the corn was laid by, and then the following spring plowed under the cornstalks, rye and vetch. He has banished timothy from the farm and grown alfalfa and hungarian for hay. He has also plowed under hungarian and above all he has spared the match and plowed under every weed that escaped cultivation and every cornstalk grown on the farm — this, supplemented with an abundance of green manuring, soil covering and some manure, has so restored the soil of this farm that it produces bumper crops of corn, potatoes and any crop the author wishes to grow upon it.

A PROMISING POTATO FIELD.

Picture taken September 11, 1909. This field was fertilized by plowing under heavy crop of vetch; it yielded 250 bushels per acre of large, fine potatoes.

CHAPTER XV

KING CORN

CORN has been proclaimed the King of all Cereals, and who can dispute his title?

While corn is of one species, its varieties are numerous. It is one of the most beautiful and useful plants that grows. Owing to its being so common, we lose sight of its beauty, yet in parts of the world it is cultivated as an ornamental plant.

More people eat corn than any other grain except rice.

Corn is the farmer's best crop, because it not only furnishes food for himself and beasts, but returns the most money for the least labor and expense of any crop on the farm.

Corn is not adapted to all climates. But while it is affected by climate and soil, yet by continuous cultivation from the same seed, year after year, it can be made to establish itself in most any locality.

Corn, being distinctly an American plant, is produced chiefly on American soil. But not all our soils will produce corn. The "corn belt" is limited, embracing chiefly the great states of Ohio, Indiana, Illinois, Iowa, Nebraska, Kansas and Missouri. Other states grow it, but not to the extent of the states mentioned.

There was produced in the corn belt in the year 1909

2,772,367,000 bushels of corn, and yet the price of corn is high, showing that the uses of corn are large.

The consumption capacity of the world for corn is so great that there does not seem to be any danger of an overproduction. In fact, the demand for corn is greater than the supply, or the price would not be so high as it is now.

On account of our soils losing in fertility, the average bushels per acre is not increasing as it should.

If corn is the easiest, cheapest and best money-making crop grown on the farm, then farmers should become enthusiastic over any method that will bring about a greater yield per acre.

In the preceding chapters I have shown the original process of soil building and the best methods of soil restoration.

The methods of soil building I have detailed are not chimerical, but are real, practical, cheap and at the command of every American farmer. They will put your soil in the right condition to grow 100 bushels of corn per acre.

While good soil well prepared as a seed bed is the very foundation of a good corn crop, it is not the only thing needed to produce a large crop. You must have good seed. Seed selection is important in any crop. The loss occasioned by poor seed is enormous, and it can all be avoided with a little care.

Too many of us depend on our seedsmen, and as they assume no liability on account of poor seed, we are helpless if our seeds prove to be bad.

The author purchases every year for his own growing seeds amounting to thousands of dollars, and his long experience in the purchase and growing of seeds has persuaded him that there ought to be a drastic law regulating the selling of seeds. There are so many dishonest persons dealing with dishonest seeds that the honest dealer is often imposed upon, but under present methods the grower suffers the entire loss of poor, unreliable seeds.

Wherever it is possible to do so, the farmer should grow his own seed crop. When it is necessary to purchase, deal only with reliable persons and houses.

Seed corn is so easily grown and cared for. It is said that the best time to begin selecting seed corn is while you are cultivating the corn, by noticing the most promising stalks and ears; but as we are usually too busy at this time to do this, the practical time to select is at husking time.

In selecting seed corn, the stalks and husks should be first noticed. The ear should be on the stalk at a medium height from the ground, and the ear should bend downward.

The husks should cover the ear entirely. The following rules for selecting good seed corn are as good as any that can be given:

"The ear should be full and strong in middle portion. The circumference in the middle should be about three-fourths of the length of the ear.

"The rows of kernels should be straight, and not less than 16 nor more than 22 in number.

"The length of ear should be not less than 8½ inches.

"White cob in yellow corn or red cob in white corn disqualifies.

"Twelve or more foreign kernels disqualifies.

"The kernel should be twice as long as it is broad and of medium size. The edges should be nearly straight, so as to leave only a slight crease between rows on outside of ear.

"There should be no space between the tips of the kernels, either on sides or edges.

"Kernel indentation should be regular and fairly deep, but not pinched, which would make crown chaffy. The kernels should be uniform in shape and size.

"The ear should be firm and sound. The germ should be well developed, indicating strong vitality."

Seed corn should never be exposed to freezing weather unless it be thoroughly dry, and should be put in a dry place, where ventilation is perfect.

The time and method of gathering seed corn, as given by the Agricultural Experiment Station of Purdue University, is so practical and good that we quote them in full:

"To get the best seed corn it should be selected in the field after it has matured and while the characters of the parent stalk can be observed. This can be done to the best advantage by going through the field after the corn is mature and before the general harvest begins and picking ears of good size and quality from the stalks that are strong and vigorous looking, but not coarse. There should be a large leaf development. The leaf is the laboratory of the plant where the food it gathers is

manufactured. The stalk should be of medium size, strong at the base and tapering gradually to the tassel. It should stand up well and bear its ears at a convenient height for husking. The shank should be of medium length and strength. A short shank holds the ear too erect, while a long shank allows it to hang over too far. Ears on long shanks or high up on the stalk are more likely to pull down the stalk during a wind storm, besides being inconvenient to husk. The ears selected should be strong and well developed, with straight rows of regular sized kernels. The kernels should be rather deeply dented. The smoother kernels are generally shallow and will not produce so well. The seed ears should always be a little rougher than the average of the crop, otherwise the variety will become smoother each year and the kernels shallower. The dent, however, should run squarely across the kernel, and there should be no sharp or pointed margins.

" Seed corn should never be picked before it is mature. An immature kernel has not had time to store up all the food it wanted, and consequently will be more or less weak in vitality. Early picked corn, if well preserved, may germinate well under favorable conditions, but its constitution has been weakened, and the yield will be correspondingly lessened. Nature should be allowed to ripen the seed in her own way.

" Selecting seed corn from the crib is always objectionable. The vitality has generally been more or less injured, and, while the ears selected may have a good appearance, one can tell nothing as to the character of the stalks which produced them. Numerous experi-

ments have shown that crib corn produces smaller yields than corn that has been properly selected in the field and well preserved through the winter.

"The quantity of seed corn selected from the field should always be considerably more than will be needed for planting, so that there may be room for further and more critical selection later on. If the quantity of seed ears selected before the general husking is insufficient, it is a good plan to have a small box attached to the outside of the wagon box into which desirable seed ears found while husking can be put."

When you buy seed corn, get it on the ear and from a place in your same latitude, and an early variety.

All seed corn should be tested before planting. The importance of this is seen when we consider that generally farmers do not get more than an average of 75 per cent. of a stand of corn, when the average should not be less than 95 per cent. After corn has once been planted it is generally too late to replant the entire field if the stand is poor, and I have never known replanted corn in missing hills to make anything more than fodder.

The method of testing seed as given by the Purdue University Agricultural Experiment Station is as follows:

"There are many simple methods of making the germination test, but in all cases each ear should be tested by itself. Experiments have shown that as a rule the testing of a few kernels picked at random from different parts of the ear will safely determine whether or not the ear should be used for seed. About five kernels should be taken from each ear and kept separate, and the ear from which they came must be marked in such a way

that it can be readily located after the test is made. In selecting the kernels for the test, take one from near the butt, three from various parts of the middle portion, and one from near the tip. Look for elevated or swollen spots on the ear from which to take the kernels. If there are any weak germs, they are likely to be found on the swollen spots, because there the cob was probably more or less spongy and retained moisture after the rest of the ear was dry and out of danger of being injured.

"The requisites for germination are moisture, warmth and air. Any chamber or vessel in which these can be provided will answer the purpose. The exact method employed will be largely a matter of convenience. An ordinary dinner plate with a double fold of moistened muslin between which the kernels can be laid, covered with another plate to prevent too rapid drying, makes a very good germinating chamber. A shallow box into which several lots of kernels may be laid between folds of moistened paper and covered with a lid will do. A shallow box containing moist earth or sawdust in which the kernels may be planted may also be handy. In any case the tester should be put in a warm place, but not too near the stove. The temperature of the ordinary living room is about right, provided that it does not become colder than 55 degrees during the night."

After seed has been properly saved and tested, and having your soil built up in the manner I have detailed in previous chapters, the next important step is the preparation of the seed bed.

In a previous chapter I showed the importance of breaking up the soil at the right time, and assuming that

that is done properly, the same should be worked down to as nearly level as possible immediately after plowing. The best plan is to run over each half-day's plowing with some good pulverizer. A level, well-pulverized surface absorbs heat and retains moisture, both essential to good corn growth.

A pulverizer should be used that will pulverize the soil to a depth of at least three inches.

Where soil is dry at plowing time, or where a heavy coating of green crops or organic matter has been plowed under, I would advise the use of a roller or drag before using a pulverizer. No time is lost by running the pulverizer over your fields in opposite directions. We all hurry too much in preparing the seed bed. If we would run the pulverizer over our fields a dozen times, or for a week before planting, it would more than pay us for the time spent. Our soil would be level, mellow and in good tilth. The planter could be run with ease and at a uniform depth, and the seed would be placed in a bed of warm, moist earth, surrounded by every condition conducive to quick, healthy growth, thus securing a better stand of corn. The growth of weeds would be so checked that the corn would have a chance to reach the cultivating stage before they were of any size.

Having the seed bed in proper condition, the next important step is planting. In the main part of the corn belt the best time to plant is between the 1st and 10th of May. As a rule, planting cannot be done with safety before May 1 unless the spring is early and the soil is in excellent condition as to dryness and warmth. In the south part of the corn belt planting may be earlier. It

is not infrequently the case that good seed will fail to grow when planted too early or when the soil is too moist and cold. Heat, air and moisture cause the growth of seeds, and the seeds must have just the right proportion of each; too much of either one is injurious to the plant.

The earth should be pressed firmly over the seed, which causes the moisture to come in contact with the outer covering of the seed and produces a sufficient amount of heat by preventing air circulating too freely around the seed. The seed placed in the soil under favorable conditions commences to grow at once.

Again, corn should not be planted too deeply.

In my long experience in growing sweet corn I have learned that two-thirds of the poor stands may be attributed entirely to too deep planting. I make it a rule to plant not over one inch in depth, and when seed is good always get 95 per cent. and over of a stand. Planted five inches in depth, the seed will not germinate 5 per cent. The same is true as to field corn. A covering of one inch is sufficient. Covered three inches or more, growth is unhealthy and not rapid.

Corn has two sets of roots, one above the surface and the other underground. The ones above the surface are the brace roots, and do not perform their functions until the plant is of considerable size, generally not until the corn is laid by. These roots are important to corn growth, because they push out and penetrate deeply into the ground at a time when the corn plant is bearing its harvest and needs to be supported from the onslaught of winds and storms.

These brace roots shoot out from the plant above its

first joint, about an inch above the grain. Plant the grain too deep, a new and unnatural joint must be formed at the surface (it is never formed under the surface), from which the brace roots begin to grow. This new joint-forming process stays the growth of the plant until the new joint is formed.

Heretofore I have tried to impress upon my readers the fact that we should study Nature's ways of doing things, so that we may avoid doing that which crosses her, for if we do we pay the penalty.

A study of corn growth will convince any student of nature that corn is injured when its seed is planted to a greater depth than one inch. If this be true, then the practice of planting corn in a furrow and filling the furrow by cultivation is wrong.

Next to planting the corn the proper depth is a good corn planter with which to plant the seed.

A poor corn planter is about the worst nuisance on the farm. Get the best that can be procured, and consign all poor ones to the scrap heap.

In selecting seed corn discard tips and butts and run seed through a grader so same is of uniform size before using in planter. The planter should be set for planting two grains to the hill.

Extra strong soil will mature three grains to the hill, but under all conditions I have found that it is best to only plant two grains to the hill; but in planting two grains to the hill it is very important that you have good seed or your stand may be poor.

Between planting and cultivating there elapses generally two weeks. Sometimes, on account of rains, this

time may be extended, especially if our soils are naturally wet and not well drained. When it is possible to work the soil we should not be idle during this time. We must not forget that a crust on the soil causes the soil moisture to evaporate very rapidly. A loose soil prevents this and absorbs moisture from the air.

An insufficient quantity of available moisture is a great cause for short crops, hence the importance of doing that which will conserve the moisture so the corn roots will absorb it.

Nothing conserves moisture in the soil like a soil mulch. This soil mulch is the great secret of corn cultivation. A large crop of corn cannot be grown without it, so the necessity of beginning to create soil mulch in the earlier stage of corn growing, or between planting and cultivating time. It will practically stop all moisture evaporation from the surface of the soil, and stirring the soil will kill the weeds, so to procure this soil mulch the harrow or pulverizer should be run over the planted corn before the corn sprout has pushed its way through the soil.

"WELL! I WONDER WHICH IS THE BEST SEED EAR."

CHAPTER XVI

THE CULTURE OF CORN

CORN can only reach its highest stage of development when it is properly cultivated. The corn root is the mouth of the corn plant, as its food is collected from the soil and fed to it through its roots, hence the necessity of protecting the corn roots and putting about them the environments essential to their best development and growth.

The corn roots must be protected so they can perform their functions of collecting plant food undisturbed.

Any method of cultivation that destroys any portion of the corn roots is disastrous to the corn plant, and reduces the yield in proportion to the amount of roots destroyed.

Eminent professors of corn culture have by experiments proven that corn roots pruned to the depth of three inches, six inches from the hill, cut the yield six bushels to the acre, and four inches deep, eighteen bushels to the acre.

Cultivating deep and tearing off the corn roots after the second cultivation will decrease the yield from three to twenty bushels to the acre; so any method of corn cultivation that destroys the roots must be abandoned if we would secure the highest and best yield.

As to the two first cultivations, corn may be cultivated

deeply, but after that the cultivation should not exceed one or two inches in depth.

Corn roots must have plenty of moisture, and they seek this moisture near the surface. During the growing season the corn plant will absorb its own weight of water over and over again, and as this water passes through the corn system the corn food is carried into the cells of the leaves, where the sunlight transforms it into the material that the plant needs in its growth.

It is said that the leaves of the corn plant on an acre of soil will throw off during a season water that would cover the ground to a depth of ten inches.

This, if true would prove that we must conserve the soil moisture if we successfully grow corn. This is the most important feature of corn culture, and one we must learn and appreciate.

That system of corn culture must be adopted which will conserve the soil moisture so that it may be available in sufficient quantities during each day of the growth of the corn plant. The moisture must not be allowed to evaporate from the ground.

The only way to preserve soil moisture and prevent evaporation is to keep stirring the ground to the depth of one or two inches, so as to procure the soil mulch or blanket of finely pulverized soil on top of the ground. We must ever keep in mind that corn has but two sets of roots, feeding and bracing. The feeding roots are small and tender, and run out from the plant in a horizontal direction and when full grown exceed the height of the stalk. They first appear but a few inches below the surface and never penetrate to the depth at which

the soil was broken until the corn is in silk. An examination of the field during the growing season from the second cultivation to the "laying-by" time will show these feeding roots occupying the entire soil between the rows of corn.

When the corn reaches its silking stage these roots will appear in great quantities. They are searching for food and moisture to complete the growth of the corn plant; hence the necessity of their protection and conserving the moisture for their use.

No weeds must be allowed to grow, as they rob the corn roots of food and moisture needed for the corn plant. Cultivation must be kept up as long as possible, so that the soil moisture may be maintained until the corn plant has stored sufficient food to mature its ears of corn.

My most successful method of corn culture is to first run the harrow or weeder over the corn a few days after planting and before the corn has come through the soil. One good harrowing with the harrow or weeder before the corn is up does more good than two or three plowings as it kills all sprouting weeds and stirs all portions of the soil. In fact a weeder can be used to great advantage in cultivating corn from the time it is planted until it reaches a height of several inches, running over the corn several times during that period.

The author knows of a farmer who uses the weeder on his corn from the time it is planted until it is knee high, going over his corn as many as five or six times during that period.

When the farmer was first noticed doing this he was

asked in a spirit of derision if he intended to gather his corn with a weeder. But this farmer's corn is always entirely free from weeds and produces fine yields no matter how dry the season may be.

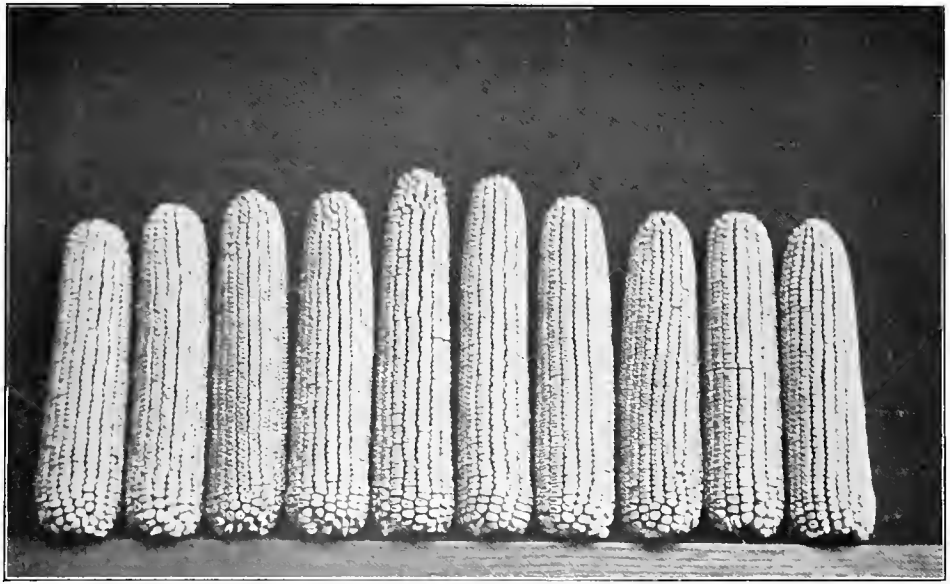
When the corn is large enough plow the corn each way as deep as possible getting as close to the corn as you can. All cultivation after this must be such as stirs the soil to the depth of an inch, the cultivation to be frequent and kept up until the corn is well along towards maturity. When corn is too large to cultivate with two-horse cultivators, a one-horse cultivator that barely scratches the soil should be frequently used.

Good corn culture means an early starting and a late discontinuance of the cultivators.

I have known corn yields to be cut short by lack of early and late cultivation. When the growth of corn has been once stunted the damage done cannot be repaired.

I once gave one-half of a field of corn two late cultivations with a one-horse combined harrow and cultivator, and increased the yield nearly ten bushels per acre over the half not cultivated.

The corn's crisis is when it has completed its stalk growth and begins making the ear. If at this time the dry season begins and soil becomes so compact and dry that moisture and air is excluded, conditions favorable to the proper maturity of the ear are cut short. At this critical time the cultivators should be kept moving.



TEN GOOD EARS OF BOONE COUNTY WHITE. BUT NOT PRIZE GETTERS.

These ears of corn would not take a prize at a corn show but old Brindle will eat them just the same; and Smith he "growed 'em" on the worn-out soil of his "Vetchfalfa Farm," built up by methods of soil building as detailed in this book.

CHAPTER XVII

SWEET CORN

SWEET corn is used almost entirely for human food, so vast quantities of it are consumed upon our dining tables. A favorite way of cooking it is to boil it on the cob, and served in this manner it is regarded as one of the "courses of the most refined and epicurean dishes." The great canning industry of the United States also consumes great quantities of it, their average yearly pack being over six million cases, of two dozen cans each.

The sweet corn plant cut up and properly cured for fodder makes a valuable feed for all stock, one of the most valuable that can be grown on the farm. Stock will entirely consume it. As a winter feed for horses it excels in value any feed grown. It puts and keeps horses in good condition. It cannot be overfed, and horses and cattle will almost entirely subsist upon it through the winter season, coming out in the spring in fine condition. It is one of the best milk-producing feeds grown, producing quantities of well-tasting rich milk. Where dairying is carried on to a large extent sweet corn fodder is considered worth ten dollars per acre. Some even claim that one acre is equal to eight acres of grass, and worth more than two acres of any forage crop grown.

Sweet corn fodder should be cut when the leaves are glazing and put in small shocks for curing.

In habit of growth sweet corn is smaller than field corn, but otherwise its characteristics are similar. It requires the same soil, attention and cultivation to grow it as field corn.

Like field corn, its varieties are many. The varieties chiefly grown for canning purposes are Stowell's Evergreen, Early Evergreen, Crosby's Early and Country Gentlemen, the first and last named being the leaders.

While Stowell's Evergreen has large ears, it is the sweetest and most valuable of all. The author's large and long experience with it for canning purposes has convinced him that this variety gathered in the right stage comes nearer filling the requirements for a perfect sweet corn than any variety that is grown. While it is true that the Country Gentlemen variety has the reputation and sells for the most money, yet Stowell's Evergreen plucked at the right stage has a flavor that cannot be excelled.

In the main sweet corn belt it can be planted from May 1 to July 1. Planting in wet, cold soils must be avoided, as the seed will rot. The planting of the seed should never exceed an inch in depth. As stated in the previous chapter, a poor stand of sweet corn can be attributed nine times out of ten to too deep planting of the seed.

The seed must have just the right amount of heat and moisture to germinate it properly, yet there is no difficulty in securing a stand if one is careful in planting it when ground is warm and not too wet.

There seems to be a disposition to plant sweet corn too thick. This is a mistake. There should never be to exceed three grains to a hill, and when drilled set drill to drop about one foot apart.

Good seed ought to test 95 per cent.; where it tests less than this I would advise hand picking the seed, picking out the brightest and best grains. It pays to do this, and it can be done in bad days of spring when other work cannot be done.

Canning factories pay from five to ten dollars per ton for sweet corn jerked from the stalk, and delivered to the factory in a green stage fit for canning. Some factories have a system of grading or testing by which a bushel is taken from each load and shucked and weighed, when it must come up to a certain fixed standard, but generally it is bought by the ton just as it is jerked in the field. The ten-dollar price is paid for the smaller eared variety like Country Gentlemen, which do not produce a large number of tons per acre. The highest price paid for heavy yielding varieties, like Stowell's Evergreen, is eight dollars per ton, and at this price there is money in growing it, as it will produce from four to six tons per acre, to which add the value of the fodder and you have one of the most profitable crops grown on the farm. If it does not prove a profitable crop it is because it has been planted on poor soil or its cultivation has been neglected. It will respond and produce fine paying crops if given a chance. The author has known farmers to put it on their poorest, worst drained soil, give it practically no cultivation and then curse and condemn it as a non-money maker. He knew one farmer who planted five

acres and never cultivated it once, and then he expressed himself that there was no money in growing it.

Sweet corn to be fit for eating or canning must be harvested when the shucks are green and while the grain is in the milky stage. It is of no value for eating or canning when the shuck is yellow and the grain is hard. It must be brought to the factory the day harvested. If allowed to stand in the wagon over night it heats and becomes valueless. While it is true that factories hold it over the night, yet they put it on cement or ventilated floors, where it is spread out thin so that air reaches into the interior of the pile and where there is no danger of its heating.

Sweet corn has an enemy in the worm found in the end of the ear at certain seasons of the year, and which is said to be the same worm that destroys the cotton crop, the Bollworm, which does serious damage to its ears. While this worm is found to some extent in all sweet corn, it is chiefly found in sweet corn grown in warmer latitude. For this reason sweet corn grown south of a line parallel with the Ohio river cannot be grown for or handled by canning factories with profit, as the work of removing the corn damaged by the worm adds too much expense to the finished product.

In the sweet corn growing section this worm appears late in the season, but it has been known to make its appearance before the season was more than one-half past, and to put a complete stop to further operations of factories. It always appears to a considerable extent in late planting. For that reason sweet corn for canning purposes should never be planted later than June 15 to

20. No remedy has yet been discovered by which this worm or its parent can be destroyed.

The chief sweet corn growing states for canning purposes are Illinois, Iowa, Maine, Ohio, New York, Maryland, Wisconsin and Indiana. The states are named in the order as to quantity produced for canning. While Maine has the reputation of packing the best corn, yet all the other states mentioned can and do pack just as good corn as Maine.

The canning of sweet corn so as to be palatable is an art in which but few are skilled. The best of sweet corn can be spoiled in canning. Like the preparation of any food, so as to be a delight to the taste, it is generally up to the cook.

Sweet corn to be good must be sweet, and this sweetness cannot be artificially supplied by the addition of sugar, for the original sweetness cannot be imitated.

No northern state has any advantage over another as to possessing a soil or climate that will produce sweet corn containing an abundance of natural sweet, for southern states will grow sweeter sweet corn than any northern state. It is a fact, however, that sweet corn grown on sandy soil will contain more sugar than that grown on muck or heavy black soils. If Maine packs better corn it is because she has better cooks in her canning factories, and possesses more skill in knowing how to handle the raw material so as to prevent it from deteriorating before it gets into the can.

Sugar begins to disappear from sweet corn as soon as the ear is separated from the stalk. A chemical change sets about at once and the sugar is transformed into

other substances. The rapidity of this changing process can be arrested to a certain extent only by handling the corn quickly and keeping it at as low a temperature as possible. A large body of plucked sweet corn will heat very quickly and become worthless, because the chemical change brought about by the heating destroys the sugar in the corn. If any northern section of the country has any advantage over another in producing good sweet sugar corn, it is because it has such a low temperature that the corn can be kept in a tender and cool stage for a longer period of time.

An excessive rainfall is injurious to sweet corn. During a dry season if a healthy growth can be maintained the product will contain more sugar. By proper cultivation during dry weather a healthy growth can be maintained and a large growth of corn can be produced. The author demonstrated this during the seasons of 1908 and 1909 to his complete satisfaction. The season of 1908 was very dry, and his crop of sweet corn was the best quality and the best yield he ever produced. The season of 1909 was too wet, and his crop did not come up to quantity produced to the acre by a ton or more, and the quality was not as good.

When the skin of the grains of sweet corn is broken it undergoes fermentative changes at a rapid rate because of its high percentage of sugar, and this also affords an opportunity for dangerous bacteria to enter into the corn juices, resulting in sour corn, the canners' worst enemy. No amount of heat that can be applied by canning apparatus will destroy them. It is said that the source of the germ of these bacteria is from the ears

of corn, their presence being found on the kernels beneath the husks.

All this shows the necessity of great care in getting sweet corn into the factory in the right stage, condition and manner and the proper handling of it in the factory.

Sweet corn has a low conducting power of heat, hence the necessity of a long period of heating in order that bacteria that produce spoliation be killed. If not sufficiently heated the center of the can is not sterilized and souring begins there.

The reason the housewife does not successfully can sweet corn is because she does not submit it to a proper heating process. If she would boil it seven hours in a kettle it probably would keep for her.

A woman once asked the author the name of the acid he used in his canning factory to preserve sweet corn in the can from spoiling, and when she was informed that no acid was used, but that the preserving process was obtained solely by sterilization or heat, she was incredulous and went away firmly believing that the author was lying.

A GOOD TYPE OF SWEET CORN SEED, STOWELL'S EVERGREEN.

CHAPTER XVIII

A CHAPTER OF DON'T FORGETS

DON'T FORGET — That soil is as jealous as a lover; neglect or mistreat it and its bounty is withdrawn. Caress and feed it, it yields a hundredfold.

DON'T FORGET — That a farmer becomes a soil robber when he does not each year put back into the soil more organic matter than he farmed out of it.

DON'T FORGET — That the corn stalk is one of the farmer's best by-products. A ton of them contains sixteen pounds of nitrogen and nearly as many pounds of potash, and the organic matter in them is of inestimable value for supplying humus to the soil.

DON'T FORGET — That the moisture-conserving capacity of the soil is increased by the plowing under of large amounts of organic matter.

DON'T FORGET — That organic matter in the soil aids soil ventilation, and furnishes supplies of nitrogen for the growing plant.

DON'T FORGET — That rye, hungarian and the legumes are the best producers of organic matter.

DON'T FORGET — That the farmer who refuses to supply the wants of his soil is traveling along the highway of the abandoned farm.

DON'T FORGET — That it takes less than fifty years to farm out the fertility of the soil if none is added in the meantime.

DON'T FORGET — That England's soil, after a tillage of centuries, is as fertile to-day as in any stage of its existence, kept so by sane methods of soil building.

DON'T FORGET — That the entire prosperity of our country is founded on the fertility of our soil, and that he only is a patriot who lends his aid to conserve that fertility.

DON'T FORGET — That the conservation of soil wealth means a full dinner pail in the hands of every workingman, a loaf of bread on every dining table and comfortable clothing on every human body.

DON'T FORGET — That the conservation and increasing of soil fertility means the building up of an empire in our Middle West, richer in power and splendor than any ever dreamed or imagined.

DON'T FORGET — That environment and greed has made us soil robbers, that we must get away from that environment and greed or perish.

DON'T FORGET — That he who gets closest to the soil reaps its richest reward.

DON'T FORGET — That he only is a farmer who loves and feeds his soil.

DON'T FORGET — That the proper feeding of the soil requires the exercise of a fertile brain.

DON'T FORGET — That a farmer who does not love his soil will mistreat it.

DON'T FORGET — That a soil robber is always a man of greed.

DON'T FORGET — That soil building is but the application of simple common sense to the solution of simple agricultural problems.

DON'T FORGET — That no one is worthy the name of farmer unless he is willing to do that which will give his soil a chance to do its best.

DON'T FORGET — That for soil to do its best it must be fed the food elements it needs.

DON'T FORGET — That the soil robber is the highwayman of agriculture.

DON'T FORGET — That crop rotation alone will not build up your soil.

DON'T FORGET — That you cannot get too much organic matter in your soil.

DON'T FORGET — That the farmer should be trained for his work as the lawyer is trained for his profession.

DON'T FORGET — That he who expects to build up his soil by crop rotation alone is doomed to failure and bitter disappointment.

DON'T FORGET — That it requires as much intelligence to direct the business of building up the soil as it does to direct the affairs of trade or commerce.

DON'T FORGET — That the more intelligence you put into your soil the more money value you will extract from it.

DON'T FORGET — That farm values are based on soil fertility.

DON'T FORGET — That the soil, like the horse, gives its best service when it is well groomed and fed.

DON'T FORGET — That he gets closest to the soil who studies its whims, its moods and its needs.

DON'T FORGET — That soil building is the most vital problem of the age.

DON'T FORGET — That the legume crops furnish the "balanced ration" needed for soils.

DON'T FORGET — That a breathing soil means a living, fruitful crop. That soil cannot breathe unless it is ditched and full of organic matter.

DON'T FORGET — That the ratio of increase of your soil will be in proportion to your interest in scientific farming.

DON'T FORGET — That the great secret of soil restoration is to keep your soil busy growing crops for both harvesting and plowing under.

DON'T FORGET — That the soil that produces the poorest crops is like an inferior farm product — it doesn't bring the price.

DON'T FORGET — That improved agriculture is brought about by fertile brains as well as fertile fields.

DON'T FORGET — That when Nature built the original soil she used a lavish supply of organic matter in its construction.

DON'T FORGET — That to pull every day a full two-horse load requires two horses well fed and groomed. To make the soil pull its load of good crops it must be fed and groomed each day.

DON'T FORGET — That the real farmer is one who manages so as to put back each year into the soil more fertility than was extracted from it by growing crops.

DON'T FORGET — That the bedrock of the paying farm is soil, well fed.

DON'T FORGET — That your success in soil restoration

depends on your gumption to catch onto Nature's ways of soil building.

DON'T FORGET — That the farmer who has no thought beyond the year's profit, has his soil headed towards the doom of soil exhaustion.

DON'T FORGET — That you increase the value of your soil in proportion to what you feed it.

DON'T FORGET — That skilled workmen are required in all trades, why not on the farm?

DON'T FORGET — That our entire substance comes from the soil. If it fails us, we perish.

DON'T FORGET — That the American farmer has yet to learn the lesson of "proper feeding of the soil."

DON'T FORGET — That soil is as sensitive and resentive of neglect as a human being.

DON'T FORGET — That in the history of nations no crisis ever came but what God produced the man to handle it, so in the crisis of soil exhaustion God has produced the plant or material that will restore it.

DON'T FORGET — That you cannot get anything out of worn-out soil until you put something in it.

DON'T FORGET — That you must forget the way the pioneer farmed. You must think only of the way the soil must be farmed to-day.

DON'T FORGET — That the purpose of this book is not so much to tell people exactly how to enrich the soil, as it is to rightly direct their thoughts and investigations that they may help themselves to solve the soil problem.

DON'T FORGET — That your severest test is in getting your worn-out soil started towards increasing fertility.

DON'T FORGET — That in pushing along the worn-out

soil towards fertility, it's the keeping at it that furnishes the momentum that accomplished results.

DON'T FORGET — That it is said that the net income of the average farmer is greater than the net income of the average city man, but that average cannot be maintained without increasing the fertility of the soil.

DON'T FORGET — That much of soil building is being done like he who is trying to pull a two-horse load with one horse hitched to the end of the tongue.

DON'T FORGET — That you cannot build up your soil as long as you continue to carry to the barn everything that grows upon it.

DON'T FORGET — That covering the soil with green crops is one of the farmer's best methods of soil building.

DON'T FORGET — That organic matter gone up into smoke leaves no residue of value to the soil.

DON'T FORGET — That crop rotation is a gay deceiver.

DON'T FORGET — That it has been said that the soil is a living thing. The better reason why it should be fed.

DON'T FORGET — That prosperous looking farms and farm buildings are but the reflex of a fertile soil.

DON'T FORGET — That the man behind the plow is no longer a force in a community when his plow is turning infertile or worn-out soil.

DON'T FORGET — That it is folly to select and plant good seed in soil too poor to grow and mature them to a paying crop.

DON'T FORGET — That the men who once grew big crops on our worn-out soils were poor farmers or else these soils would now be rich in fertility.

DON'T FORGET — That the policy of properly feeding

the soil is not only good for future generations, but for the farmer who practices it.

DON'T FORGET — That the farmer who does not ever have in view the conservation and increasing of soil fertility is obstructing his own way to success.

DON'T FORGET — That he who produces the best crops is the one who ditches and feeds his soil the best.

DON'T FORGET — That the farmer who says he cannot afford to plow under green crops, will soon say there is no money in farming.

DON'T FORGET — That there is no limit to the possibilities of our well-drained soils so long as we do not limit their feed of organic matter.

DON'T FORGET — That you cannot overfeed your soil with organic matter.

DON'T FORGET — That the truly successful soil builder is the one who drains his soil, tills it well, feeds it large quantities of organic matter and keeps it busy with growing crops.

DON'T FORGET — That the physical condition and available plant food of the soil can only be maintained by feeding it with plenty of animal and vegetable matter.

DON'T FORGET — That the foundation of soil building is draining.

DON'T FORGET — That draining a soil is like currying a horse — it opens the pores and increases circulation.

DON'T FORGET — That organic matter is farmed out of the soil in less than four years; hence the necessity of adding to the supply each year.

DON'T FORGET — That well-drained soil full of organic matter is never sour.

DON'T FORGET — That it is the folly of follies to use commercial fertilizer on soils lacking in organic matter.

DON'T FORGET — That it takes as much plant food to grow weeds as corn; kill the weeds.

DON'T FORGET — That the boy and the girl are two of the best products of the farmer, if trained along the lines of scientific agriculture and farm domestic science.

THE FARMER'S BEST PRODUCT, IF EDUCATED ALONG THE LINES OF SCIENTIFIC AGRICULTURE.

CHAPTER XIX

CONCLUSION

IF in the perusal of the preceding chapters the reader has imbibed some of the author's enthusiasm for soil building, crop-growing and love of nature, then the mission of this book has borne good fruit.

There is no grander nor more useful study than the study of the soil problem. It is a study that is of more vital interest to the public than any other, for the very fabric of life depends upon its correct solution.

Since penning the proem and introduction of this book a mighty agitation has swept over and into every part of our country regarding the high price of living.

The price of farm products and manufactured goods being higher than known for years, our people are engaged in a great discussion trying to ascertain the cause of these high prices.

The concensus of opinion seems to be that the chief cause of high prices is the fact that too many of our people have left the farms for our cities, so the cry has gone up that the only solution of the question of high prices is "more producers and less consumers." "Back to the Farm" is the slogan.

Our educational system is faulty. The boy and the girl have been educated away from the lines of agriculture and farm domestic science.

The ambitious country boy with bright, sharp intellect has had held up to him only the ideals of business and professional life. The soil problems, the love of nature, the joy and financial returns of farming fertile fields and the peacefulness of good farm surroundings have had no place in his education, so he has grown up believing that no true happiness or financial gain is to be found on the farm.

The farmer boy so educated has drifted into the never-ending strife and worry of city men and business, and our farms have lost the best bloom of our young manhood.

True, some of the boys have attained success and eminence, and maybe happiness, but the vast majority of the mighty army of boys who have drifted from the farm into the cities bear the marks of disappointment and blasted lives; they have not gotten out of life what they would have gotten had they been educated along the lines of scientific agriculture and remained on the farm.

While we are changing our methods of farming, so as to build up our soils, let us so change our educational system that it will educate our boys and girls to live rural lives and help to solve the problem of the soil and of farm domestic science, that the fields of our farms will be made richer, our herds and flocks be built up of better grades, our homes inside and out be made more pleasant and more attractive.

When this is done the great procession of boys and girls will be headed towards the farm, and the profes-

sions, the mercantile and manufacturing business will be relieved of the congestion of workers.

Nearly forty years ago the author, a boy of fifteen, bid an affectionate adieu to his mother on the old farm porch and set his face towards the city and entered its busy activities. He engaged in mercantile pursuits for a time, attending school and college, educated himself for the profession of law, engaged in the successful practice of his profession for many years, engaged in manufacturing, farming, political strife and office holding, and now finds himself past the meridian of life with a great fund of experience to his credit.

But now as the border land of eternity appears to view, realizing that it will be but a short time until "life's fitful dream" will be o'er, he yearns to spend the remainder of his days upon the farm, that he may regain some of the lost pleasures of farm life. Upon the farm, where, far removed from the bitter, galling strife of men, he may commune with nature, study soil problems, smell the bloom of vetch and clover, admire the beauty of growing plants, hear the songs of birds and the soothing rustle of the corn, and bask in the delights of sunshine and open sky.

Farmers of America, you do not realize what God and Nature have done for you. Your lines have indeed "fallen in pleasant places," but oh, so many of you have failed to grasp your opportunities. Ye are God's chosen people and yet you do not act it.

If you are tempted to leave the farm, command the tempter to get behind you. Stay with your fields, your

flocks and herds, improve your surroundings and make them more attractive; train your boys and girls to be good farmers and housekeepers and enjoy the peaceful, restful life of the farm.

There's music in the words, "Back to the Farm," but there is sweeter music in the words, "Better Stay on the Farm a While Longer."

"The farm is the safest and surest,
The orchards are loaded to-day;
You're as free as the air of the mountains,
And monarch of all you survey.

"Better stay on the farm a while longer,
Tho' the profits come in rather slow;
Remember you've nothing to risk, boys,
Don't be in a hurry to go."